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A Revision of the Genus *Olyra* and the New Segregate Genus *Parodiolyra* (Poaceae: Bambusoideae: Olyreae)

THOMAS R. SODERSTROM
and
FERNANDO O. ZULOAGA

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A Revision of the Genus *Olyra* and the New Segregate Genus *Parodiolyra* (Poaceae: Bambusoideae: Olyreae)

Thomas R. Soderstrom
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SMITHSONIAN INSTITUTION PRESS
Washington, D.C.
1989

ABSTRACT

Soderstrom, Thomas R., and Fernando O. Zuloaga. A Revision of the Genus *Olyra* and the New Segregate Genus *Parodiolyra* (Poaceae: Bambusoideae: Olyreae). *Smithsonian Contributions to Botany*, number 69, 79 pages, 46 figures, 2 appendices, 1989.—The herbaceous bambusoid genus *Olyra* is revised. Four new South American species are described: *Olyra amapana, O. latispicula, O. retrorsa,* and *O. tamanquareana.* Three species of *Olyra* were found to differ significantly from the rest of the genus in possessing the following combination of characters: weak, scandent culms; filiform female spikelet pedicels; female spikelets that fall entire, have a pulvinate internode between the inflated glumes, and a stipitate anthecium; and a hilum that does not extend for the entire length of the caryopsis. The segregate genus *Parodiolyra* is established to accomodate these species, and the new combinations *P. lateralis, P. luetzelburgii,* and *P. ramosissima* are proposed. The new genus may share affinities with *Raddiella* and *Diandrolyra* rather than *Olyra.*

Keys to the species in both genera are presented, as well as complete descriptions, field photographs, and distribution maps. Scanning electron microscope studies of the surface of the female anthecia yielded characters of taxonomic significance. These are illustrated and incorporated in the key. Two appendices account for all names that have been published in the genus *Olyra.*

OFFICIAL PUBLICATION DATE is handstamped in a limited number of initial copies and is recorded in the Institution's annual report, *Smithsonian Year.* SERIES COVER DESIGN: Leaf clearing from the katsura tree *Cercidiphyllum japonicum* Siebold & Zuccarini.

Library of Congress Cataloging-in-Publication Data
Soderstrom, Thomas R.
A revision of the genus *Olyra* and the new segregate genus *Parodiolyra* (Poaceae: Bambusoideae: Olyreae).
(Smithsonian contributions to botany ; no. 69)
Bibliography: p.
1. *Olyra* — Classification. 2. *Parodiolyra* — Classification. 3. Grasses—Classification.
I. Zuloaga, Fernando O. II. Title. III Series.
QK1.S2747 no. 69 [QK495.G74] 581 s-dc19 [584'.93] 88-22646 CIP

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Preface

My first experience with *Olyra* came in 1962 on an expedition to Kaieteur Falls in the interior of Guyana (then British Guiana) in northern South America. Large clumps of *O. latifolia* were scattered here and there, mostly at the edge of the forest or in clearings where trees had fallen. The unusual grass *Pariana*, with yellow spike-like inflorescences and spikelets with multiple stamens, was also found here. Both genera looked like bamboos in the field, but when I returned to Washington I found *Olyra* filed in the herbarium in the Paniceae and *Pariana* in the Hordeae because of the spike-like inflorescence. I would now include *Olyra* and several other genera, including *Pariana*, in the Olyreae (Soderstrom and Ellis, 1987).

On a collection trip to Suriname in 1963, I was impressed by the growth habit of *Olyra luetzelburgii*, a clambering plant that grew abundantly at the forest edges abutting a granite outcrop. The plants appeared to be related to *Olyra* but differed from it. Later, as part of continuing studies on the different genera of the Olyreae, it became evident that this species and two others that had been included in *Olyra*, *O. lateralis* and *O. ramosissima*, formed a natural group that deserved recognition as a separate genus. Here, we name that genus *Parodiolyra* in honor of the Argentine agrostologist Lorenzo R. Parodi (1895–1966).

Several species of *Olyra* have been transferred to other genera (*Arberella*, *Cryptochloa*, *Piresia*, and *Sucrea*). With the transfer of three more species to the new genus *Parodiolyra*, and with the new species herein described, this leaves twenty-three species in *Olyra*.

The visit of Dr. Fernando O. Zuloaga of the Instituto Darwinion in San Isidro, Argentina, to the Smithsonian in 1982–1983, was a fortuitous event. Dr. Zuloaga came to Washington to continue his studies of New World *Panicum*. As part of his investigation he made extensive scanning electron microscope (SEM) studies of the surface of the anthecia of all species. He found significant differences in the surface texture and ornamentation, which were most useful in the taxonomy of the genus. An early key to *Olyra* that Cleofé E. Calderón and I had prepared was based in part on characters of the surface of the female anthecia, but only of those that could be seen with the light microscope. Because of the similar type of anthecium in *Olyra* and *Panicum*, Zuloaga decided to run SEM studies on all species of *Olyra*. These proved to be quite useful taxonomically, and he extended these studies to the anthecia of other taxa in the tribe Olyreae, including *Parodiolyra*. The present revision is based on classical and SEM studies. Characters from both approaches are incorporated in the keys.

T.R. Soderstrom
22 April 1987

A Revision of the Genus *Olyra* and the New Segregate Genus *Parodiolyra* (Poaceae: Bambusoideae: Olyreae)

Thomas R. Soderstrom
and Fernando O. Zuloaga

Introduction

The genus *Olyra* is found throughout the Neotropics. The most widespread species is also the type species, *O. latifolia*, based on a specimen from Jamaica. Kunth (1815), in his system of grass classification, regarded the genus as a distinct group with a relationship to the bamboos, but he was later influenced by Trinius (1826) who aligned the genus with *Panicum*. The reasoning of Trinius has persisted into this century, due primarily to the uncanny similarity of the female spikelets of the two genera; in both, the female anthecium is usually white and indurate. In fact, while the female spikelet of *Olyra* has only one floret and two glumes, is monoecious, and has three lodicules, in *Panicum* two florets are present, with the lower usually male and the upper hermaphroditic, there are only two lodicules, and the spikelets are bisexual.

Following Kunth, one of the first to recognize the bambusoid affinities of *Olyra* was Sir Dietrich Brandis, who made an elegant anatomical study (1907) of woody bamboo leaves including broad-leaved herbaceous grasses such as *Olyra*, *Diandrolyra*, and *Pharus*. Later workers firmly established the bambusoid affinities of *Olyra*, especially on the basis of leaf anatomy characters. Other characters, such as seedling type, have also been useful in grass classification. The bambusoid type of seedling as defined by Soderstrom (1981:26) is shared by members of the Olyreae and Bambuseae. Along with the woody bamboos (Bambuseae), four herbaceous tribes (Buergersiochloeae of New Guinea, and Anomochloeae, Olyreae, and Streptochaeteae of the New World) constitute the "core group" of the subfamily Bambusoideae as recognized by Soderstrom and Ellis (1987).

The woody bamboos differ from the herbaceous in their long-lived woody culms, generally strong rhizomatous nature and complex branching, and propensity to flower only at long intervals. *Olyra* and other herbaceous bamboos usually flower each year for longer or shorter periods of time, but, interestingly, one group of related species (*O. taquara*, *O. ecaudata*, and *O. standleyi*) apparently do not flower every year, and may be monocarpic, as are many woody bamboos. The phenomenon is like that of the woody bamboos and is worth studying in these herbaceous species since it may offer clues as to the origin of this unique phenomenon in the grasses.

METHODS AND MATERIALS.—Procedures of classical alpha taxonomy were used in this study. Field methods included photographing the live plants, collecting and drying them for herbarium specimens, preserving leaves, spikelets, and other structures in FAA (formalin-ethanol-acetic acid) and transferring them to 70% ethanol in the laboratory.

Laboratory studies were made using a Wild M5 dissecting microscope and Leitz Ortholux compound microscope. For the scanning electron microscope (SEM) studies anthecia were removed from herbarium specimens, secured on stubs, carbon coated in a vacuum evaporator, and coated with a gold-palladium alloy. These specimens were then viewed in a Cambridge S4-10 or Cambridge Stereoscan 250 Mk 2 scanning electron microscope operating at 10–20 kV.

In addition to the large collections of material at US, we consulted specimens lent by the following herbaria: CEPEC, CR, F, GH, IAN, MO, NY, R, RB, U, UB, and WIS. The abbreviations of these herbaria, as well as others mentioned in

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Review Chairman: Mark M. Littler, Department of Botany, Smithsonian Institution. Reviewers: Gerrit Davidse, Missouri Botanical Garden; Lynn G. Clark, Iowa State University.

the text, follow Holmgren et al. (1981). Collection localities listed within each species discussion are quoted or paraphrased from specimen labels. Metric equivalents of English distances are provided in brackets.

ACKNOWLEDGMENTS.—Much of the early work on this revision was undertaken in collaboration with a student of the late Prof. Lorenzo R. Parodi (Facultad de Agronomía y Veterinaria, Universidad de Buenos Aires), Cleofé E. Calderón (resident of Washington, D.C.), who came to the Smithsonian from Argentina in 1964, working with Soderstrom on the Olyreae. Calderón subsequently made a number of field trips to tropical America and collected many species and specimens of *Olyra* and other bamboos. She is responsible for most of the field photographs in this paper. Much of the specimen material was collected by Calderón and Soderstrom on field trips sponsored by the Smithsonian Institution and National Geographic Society.

Zuloaga is grateful to the Consejo Nacional de Investigaciones Científicas y Técnicas de la República Argentina (CONICET) for a grant to spend two years (1982 and 1983) at the Smithsonian Institution. Final studies were made in July and August 1986 under a Smithsonian Institution short-term visitor's grant.

The illustrations of *Olyra loretensis*, *O. micrantha*, and *Parodiolyra lateralis* (Figures 24, 26, and 39) were made by Gesina Berendina Threlkeld, formerly National Museum of Natural History (NMNH), now resident of Los Alamos, New Mexico. Those of *P. luetzelburgii* and *P. ramossisima* (Figures 41 and 45) were made by Vladimiro Dudás, Instituto de Botánica Darwinion. The others were rendered by Alice R. Tangerini, NMNH. Most of the field photographs were taken by Calderón.

We also thank Mary Sangrey (NMNH) and Jon Ricketson (Missouri Botanical Garden) for valuable assistance, and Gerrit Davidse (Missouri Botanical Garden), Lynn G. Clark (Iowa State University), John Wurdack (NMNH), and Emmet J. Judziewicz (NMNH) for helpful advice and suggestions, the latter in particular for his assistance in preparing the manuscript for publication.

Olyra Linnaeus

Olyra Linnaeus, 1759:1261.
Mapira Adanson, 1763:2, 39, 574.

Cespitose, monoecious perennials, usually from creeping rootstocks. *Culms* erect and sometimes climbing, leaning on the vegetation, unbranched at the lower and median nodes, branching at the upper nodes to produce inflorescences; internodes cylindrical, glabrous to pilose, the nodes thickened to compressed, glabrous or pilose. *Leaves* with ligules small to large, membranous, shortly ciliate at the apex; auricles present or absent; pseudopetiole short, densely pilose to nearly glabrous; blades flat, ovate-lanceolate to lanceolate, asymmetric to symmetric basally, glabrous or pilose, the margins ciliate to scabrous. *Inflorescence* with one to many panicles borne at the uppermost nodes, the panicles lax and diffuse to contracted, few- to many-flowered, with the lower branches whorled or alternate, the upper ones alternate, in a few cases the panicles composed of 2–8 conjugate branches; lower branches of the panicle with male spikelets and with or without terminal female spikelets, the upper ones with male spikelets below and 1–8 terminal female spikelets; pedicels of the female spikelets thickened, the spikelets disarticulating above the glumes (with the exception of *O. micrantha*). *Female spikelets* with 2 aristate to acuminate glumes, these subequal or unequal (in this case with the lower glume longer than the upper), 5–15-nerved, usually with transverse veinlets, pilose to glabrous; *anthecium* indurate, the lemma covering the palea with its borders, shorter than the glumes, pilose, with variable types of pubescence, to glabrous, smooth or pitted; *lemma* 5–11-nerved, whitish to olivaceous, shining; *palea* 2–4-nerved; *lodicules* 3, conduplicate; *ovary* glabrous, smooth; stigmas 2, plumose; *caryopsis* brownish; hilum linear, as long as the caryopsis, the embryo $^1/_5$ or less the length of the caryopsis. *Male spikelets* aristate to acuminate, shorter than the female spikelets (longer in *O. wurdackii*), glabrous to hispid, membranous; glumes absent; *lemma* 3–9-nerved; *palea* 2-nerved (4-nerved in *O. holttumiana*); stamens 3.

TYPE SPECIES.—*Olyra latifolia* Linnaeus.

DISTRIBUTION.—Twenty-three species, found throughout the Neotropics from Mexico and Florida, United States, south to Argentina; apparently introduced in Africa (including Madagascar) and Fiji. The species typically occur in lowland, wet, tropical forests. Exceptions are noted within species discussions and in the key, below.

DISCUSSION.—We consider two names in *Olyra* to be of uncertain application, and do not treat them further herein. First, *Olyra guineensis* Steudel, 1853:37, is an African taxon described from the island of Príncipe in the Gulf of Guinea. We have not seen the type, the current location of which is unknown. Second, we could not locate the type of *Olyra speciosa* Mez, 1921:7, thought to be in the Berlin Herbarium. We could not confidently make an identification from Mez's description.

Key to the Species of *Olyra*

1. Female anthecium pitted or granular over part or all of its surface with conspicuous, round to oblong excavations 2
   2. Inflorescence conjugate, male and female spikelets on separate branches; female anthecium with rounded excavations and long, stiff hairs toward the apex, obovoid, 1/4 the length of the spikelet . . . . . 14. ***O. longifolia*** (northern South America)
   2. Inflorescence not conjugate, male and female spikelets together; female anthecium never with both rounded excavations and long hairs on its surface (occasionally with bicellular microhairs toward the upper surfaces of the lemma and palea, or unicellular retrorse hairs on the palea, as in *O. retrorsa*), ovoid to fusiform, greater than 1/4 the length of the spikelet 3
      3. Female spikelets disarticulating below the glumes, the pedicels thin, not thickened; lower and upper glumes separated by an internode; female anthecium 2.5–3.8 mm long, entirely covered by rounded excavations . . . . . 17. ***O. micrantha*** (South America)
      3. Female spikelets disarticulating above the glumes, the pedicels thickened; lower and upper glumes not separated by an internode; female anthecium at least 6.8 mm long, granular or partly to entirely covered by rounded or oblong excavations 4
         4. Female anthecium with deep, rounded excavations; leaf blades lanceolate, 11–14 cm long . . . . . 7. ***O. filiformis*** (Bahia, Brazil)
         4. Female anthecium with shallow, slightly oblong to round excavations; leaf blades oblong to lanceolate, 13–35 cm long (10.5–13.2 cm in *O. retrorsa*), the female anthecium with a unique combination of slightly oblong excavations and retrorse hairs on the apex of the palea 5
            5. Female anthecium stipitate, the stipe conspicuous, ~1 mm long; leaf blades asymmetric basally 6
               6. Inflorescences numerous at the uppermost nodes, contracted, each with a terminal female spikelet and male spikelets below; female spikelets greater than 33 mm long . . . . . 21. ***O. tamanquareana,*** new species (Amazonas, Brazil)
               6. Inflorescences 2 or 3 at the uppermost nodes, umbelliform or paniculiform, open, with 1–5 terminal female spikelets; female spikelets 13–33 mm long 7
                  7. Inflorescences paniculiform, the lower branches whorled, the upper ones alternate; female anthecium with oblong excavations; female spikelets 22–33 mm long, 2.9–3.2 mm wide; male spikelets glabrous . . . . . 6. ***O. fasciculata*** (Panama, Peru, Bolivia, Argentina, and southern Brazil)
                  7. Inflorescences umbelliform, with 2–8 conjugate branches; female anthecium with rounded to hexagonal, not oblong, excavations; female spikelets 13–17 mm long, 3.4–4 mm wide; male spikelets scabrous to densely hirsute . . . . 18. ***O. obliquifolia*** (northern South America)
            5. Female anthecium not stipitate; leaf blades symmetric basally 8
               8. Palea of female anthecium with conspicuous retrorse hairs toward the apex; lemma with bicellular microhairs toward the apex; panicles 6–10 cm long, 1–2 cm wide; leaf blades 10.5–13.2 cm long,

2.7–3.4 cm wide; ligules conspicuous, 2.5–4 mm long . . . . . 19. ***O. retrorsa,*** new species
(Mato Grosso, Brazil)

8. Palea of the female anthecium without retrorse hairs; lemma without bicellular microhairs; panicles 9–23 cm long, up to 30 cm wide; leaf blades 15–35 cm long, 4–8 cm wide; ligules small, 0.6–1.4 mm long 9

9. Female spikelets ovate, acuminate to shortly aristate, 8–11.6 mm long, 3–3.8 mm wide, the anthecium 70–80% as long as the spikelet, ovate, with prickle hairs on the margins of the lemma . . . . . 5. ***O. ecaudata***
(Costa Rica to the Guianas, Peru, Bolivia, and Brazil)

9. Female spikelets lanceolate, attenuate to aristate, 16–25 mm long, the anthecium 8.4–9.5 mm long, 2.2–3 mm wide, at most 50% as long as the spikelet, lanceolate, without prickle hairs on the margins of the lemma 10

10. Female anthecium with numerous bicellular microhairs at the tip of the palea; spikelets without purple spots . . . . . 20. ***O. standleyi***
(cloud forests, Costa Rica to Venezuela)

10. Female anthecium glabrous; spikelets often with purple spots . . . . . 22. ***O. taquara***
(gallery forests, central Brazil)

1. Female anthecium glabrous or pilose, not pitted or granular 11

11. Female anthecium glabrous (occasionally with a few bicellular microhairs at the tip of the palea or sparse prickle hairs at the margins of the lemma); ligules membranous, conspicuous, up to 10 mm long 12

12. Male spikelets (8.9–11.5 mm long) always longer than the female spikelets (7–7.5 mm); leaf blades symmetric basally, lanceolate; female anthecium a little shorter than the glumes, the palea with abundant bicellular microhairs and prickle hairs . . . . . 23. ***O. wurdackii***
(Amazonian Venezuela and Brazil)

12. Male spikelets (5–11 mm long) always shorter than the female spikelets (14–50 mm); leaf blades asymmetric basally, ovate-lanceolate to lanceolate; female anthecium half as long as the glumes, the palea glabrous 13

13. Female anthecium ovate 14

14. Female spikelets 30–48 mm long, the glumes subequal, awns 20–30 mm long; female anthecium 8.2–10 mm long, ~1/4 the length of the spikelet . . . . . 3. ***O. caudata***
(Costa Rica to Bolivia)

14. Female spikelets 14–25 mm long, the glumes unequal, awns less than 20 mm long, usually 10 mm or less; female anthecium 5.6–6.1 mm long, ~1/2 the length of the spikelet . . . . . 12. ***O. latifolia***
(Florida to Argentina; introduced into the Old World tropics)

13. Female anthecium elliptical 15

15. Male lemma 7–9-nerved, the palea 4-nerved; male spikelet 10.2–10.9 mm long, 0.8–1.2 mm wide, purplish, scabrous; female anthecium 14.5–15.8 mm long; inflorescences with the lower branches in a verticil, the upper alternating . . . . . 9. ***O. holttumiana***
(Panama)

15. Male lemma 3-nerved, the palea 2-nerved; male spikelet 5 mm long, 1 mm wide, acute, brownish, hirsute; female anthecium ~10.7 mm long; inflorescence formed from a fascicle of terminal branches . . . . . 2. ***O. buchtienii***
(Mapiri region, Bolivia)

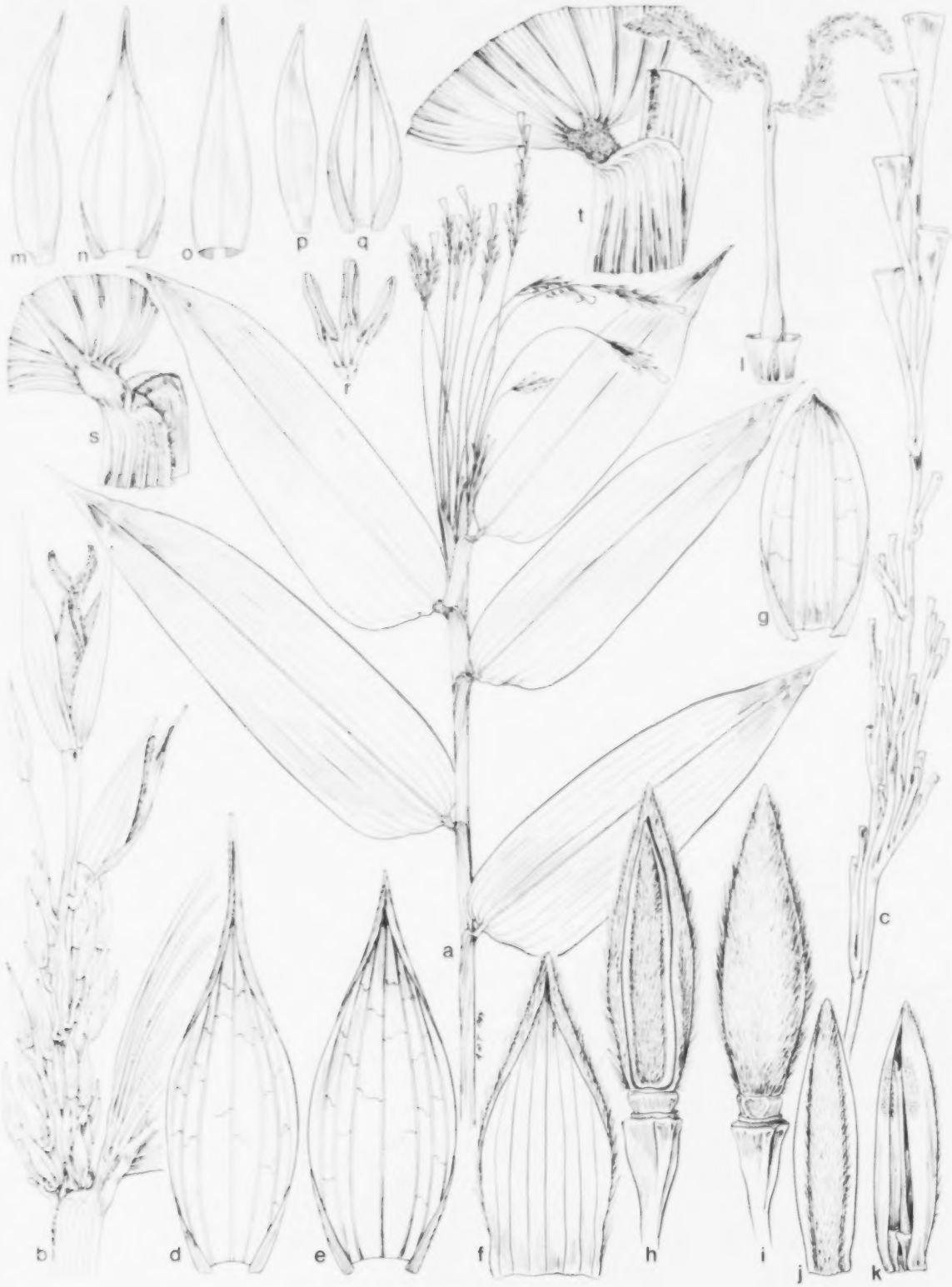
11. Female anthecium pilose, with cylindrical, flattened, or prickle hairs over the entire surface or at the base and apex of the anthecium; ligules various . . 16
16. Female anthecium broadly ovate, the lemma gibbous, with conspicuous and caducous prickle hairs over the entire surface . . . . . 13. ***O. latispicula***, new species (Bahia, Brazil)
16. Female anthecium elliptical, the lemma not gibbous, with cylindrical or flattened hairs but without prickle hairs over the entire surface 17
17. Inflorescence on reduced-leafy culms, showy, with white female spikelets terminating the branches . . . . . 15. ***O. loretensis*** (Amazonian Peru and Brazil)
17. Inflorescence on leafy culms, not showy, female spikelets various . . . 18
18. Female anthecium with long, appressed, cylindrical macrohairs covering the entire surface 19
19. Female glumes unequal, the lower glume long-aristate with an awn 10–12 mm long; female anthecium acuminate . . . . . 4. ***O. ciliatifolia*** (South America)
19. Female glumes subequal, acuminate to subulate, not aristate; female anthecium apiculate or acuminate 20
20. Inflorescences 1–4 (usually 1), borne at the uppermost nodes, open . . . . . 11. ***O. juruana*** (Amazonian Peru and western Brazil)
20. Inflorescences ~10, borne at the uppermost nodes, contracted and reaching about the same height . . . . . 1. ***O. amapana***, new species (Amapá, Brazil)
18. Female anthecium with long, flat macrohairs toward the base and apex on the ventral surface, otherwise glabrous 21
21. Male spikelets 3.5–4.7 mm long, hispid; pseudopetiole scaberulous . . . . . 16. ***O. maranonensis*** (northern Peru)
21. Male spikelets 8.5–12 mm long, glabrous; pseudopetiole densely hispid on both surfaces 22
22. Panicles 4–9 cm long, 1–5.5 cm wide, the lower branches whorled to alternate; leaf blades ovate-lanceolate to lanceolate, 4.3–11.5 cm long, 1–2.2 cm wide . . . . . 10. ***O. humilis*** (southeastern Brazil, Paraguay, and Argentina)
22. Panicles 9–23 cm long, 5–18 cm wide, the lower branches whorled; leaf blades ovate-lanceolate, 17–27 cm long, 4–8.5 cm wide . . . . . 8. ***O. glaberrima*** (San Luis Potosí, Mexico to Honduras; Peru; eastern Brazil)

1. *Olyra amapana* Soderstrom & Zuloaga, new species

FIGURES 1, 2, 15

TYPE SPECIMEN.—BRAZIL, AMAPÁ: Rio Araguari, vicinity Camp 13, 1°45′N, 52°W, in shadow of upland forest, *J.M. Pires, W. Rodrigues, and G.C. Irvine 51536* (holotype, IAN; isotypes, NY, US sheet no. 2381088).

Gramen perenne, caespitosum, culmis erectibus; nodi incrassati, pilosi. Laminae lanceolatae, 14.5–17 cm longae, 3.5–4.2 cm latae, glabratae, basi asymmetricae, apice symmetricae; pseudopetioli 0.3–0.4 cm longi; ligulae membranaceae, 0.7 mm longae. Paniculae contractatae, parvae, 2.7–4 cm longae, 1–1.5 cm latae. Spiculae femineae lanceolatae, 11 mm longae, 2.3 mm latae, albidae, glumis inter se subaequalibus, anthoecio longioribus; gluma inferior subulata, 7-nervis; gluma superior subulata, 7-nervis, anthoecium lanceolatum, apiculatum, 9.7 mm longum, 2.4 mm latum, pilosum. Spiculae masculae lanceolatae, 3.3–4.8 mm longae, 0.7–0.8 mm latae, albidae; lemma subulatum, 3-nerve; palea 3–4 mm longa, 2-nervis.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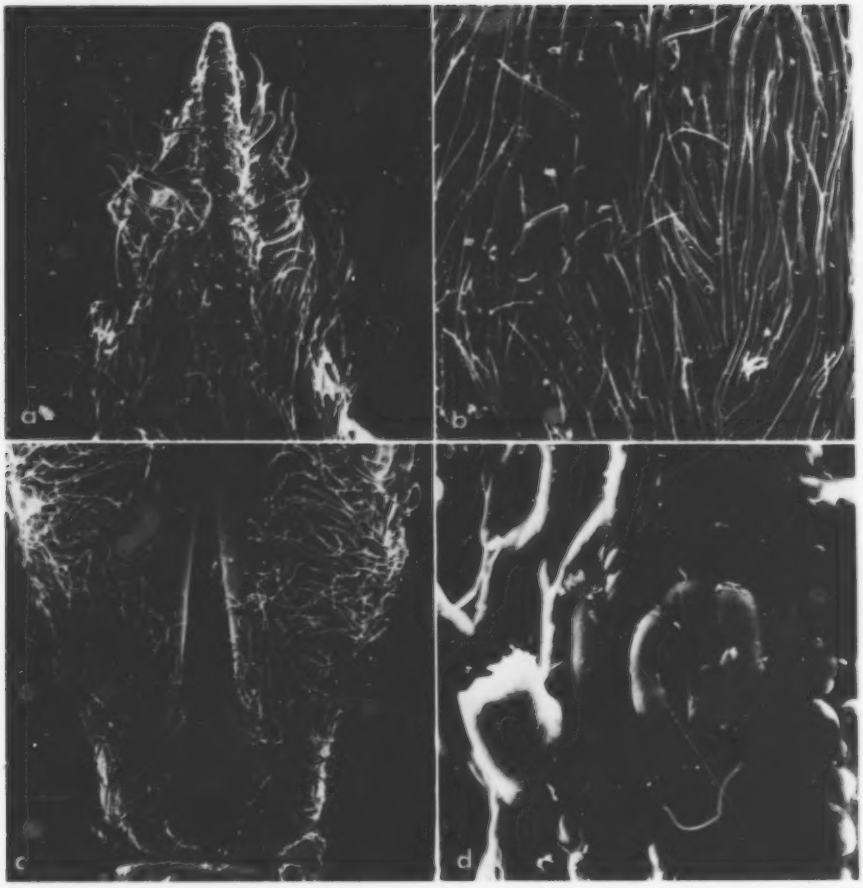

FIGURE 2.—Detail of female anthecium, *Olyra amapana*: *a*, dorsal side (× 50); *b*, detail of the ventral side showing hairs (× 100); *c*, base of the dorsal side showing germination lid (× 30); *d*, apex of the lemma, stomata (× 1000). All micrographs of *Pires et al. 51536* (US). (Reduced to 77% of indicated magnifications for publication.)

Cespitose perennials; *Culms* erect, these shortly pubescent, with whitish, appressed hairs toward one side of the culm; internodes cylindrical, hollow; nodes thickened, dark, short-pubescent on one side. *Leaves* with sheaths stramineous, strongly ribbed, short-pubescent with appressed hairs, more densely so toward the borders, otherwise glabrous; ligules membranous, ~0.7 mm long, shortly ciliate at the tip; pseudopetiole 0.3–0.4 cm long, short-pubescent on both surfaces; blades lanceolate, 14.5–17 cm long, 3.5–4.2 cm wide, glabrous, narrowed to an asymmetric and truncate base, the apex symmetric, the upper margins scabrous, otherwise glabrous, the midnerve prominent and scabrous on the abaxial surface. *Inflorescences* ~10, paniculiform, borne from the uppermost nodes, long-exserted with peduncles longitudinally ridged and scabrous to hispid, all the panicles reaching approximately the same height; panicles contracted, small, few-flowered, 2.7–4 cm long, 1–1.5 cm wide, the lower branches whorled to alternate, the upper ones alternate, with numerous long to short-pedicelled male spikelets arranged on tertiary branchlets, each panicle with 1, rarely 2 to 4, terminal

FIGURE 1.—*Olyra amapana*: *a*, flowering branch with inflorescences from upper nodes of culm (× 0.6); *b*, simple inflorescence with terminal female spikelets and lateral male spikelets (× 3.5); *c*, single inflorescence showing pedicels of spikelets (× 3.5); *d*, lower glume of female spikelet (× 7); *e*, upper glume of female spikelet (× 7); *f*, lemma of female spikelet (× 7); *g*, palea of female spikelet, inside view (× 7); *h*, female anthecium with internode and pedicel, palea side (× 7); *i*, female anthecium with internode and pedicel, lemma side (× 7); *j*, palea of female anthecium, dorsal view (× 7); *k*, palea of female anthecium, ventral view (× 7); *l*, gynecium and lodicules (× 10); *m*, male spikelet, side view (× 10); *n*, lemma of male spikelet, inside view (× 10); *o*, lemma of male spikelet, outer view (× 10); *p*, palea of male spikelet, side view (× 10); *q*, palea of male spikelet, inside view (× 10); *r*, male flower (× 10); *s*, pseudopetiole, lower surface (× 5.5); *t*, pseudopetiole, upper surface (× 5.5). All components based on *Pires et al. 51536* (US). Illustration by A.R. Tangerini.

female spikelets; *axis* longitudinally ridged, scaberulous, the axis of the branches similar to the main axis; pedicels of the female spikelets thickened, smooth, glabrous, those of the male spikelets smooth and glabrous. *Female spikelets* fusiform, glabrous, whitish, 11 mm long, 2.3 mm wide, the glumes subequal, the anthecium a little shorter than the glumes; *lower glume* subulate, 7-nerved, glabrous on the outer surface, shortly pilose toward the apex of the inner surface; *upper glume* subulate, 10.3 mm long, 7-nerved, scaberulous toward the apex of both surfaces; *anthecium* fusiform, apiculate, 9.7 mm long, 2.4 mm wide, smooth and shiny, covered with long, whitish, cylindrical macrohairs. *Male spikelets* fusiform, 3.3–4.8 mm long, 0.7–0.8 mm wide, whitish, scaberulous on the outer surface to glabrous; *lemma* subulate, 3-nerved; *palea* 3–4 mm long, 2-nerved.

DISTRIBUTION.—Endemic to wet forests of Amapá, Brazil (Figure 15); known only from the type collection.

DISCUSSION.—This species resembles *O. juruana*, from which it differs by the numerous, long-pedunculate axillary panicles present at the upper nodes, each panicle with one, rarely two to four, terminal, female spikelets.

2. *Olyra buchtienii* Hackel

FIGURES 3, 4

Olyra buchtienii Hackel, 1912:20. [Type: "Bolivia: In silvis ad San Carlos prope Mapiri, 750 m.s.m., 1907, leg. Dr. *O. Buchtien no. 1157*." Holotype, W, not seen; isotypes, F, US (sheets no. 1099260 and 2877960).]

Cespitose perennials, ~3 m tall. *Culms* erect, branched at the upper nodes; internodes cylindrical, hollow, glabrous; nodes thickened, dark brown, glabrous to shortly pilose. *Leaves* with sheaths glabrous, 13–20 cm long, striate, with membranous

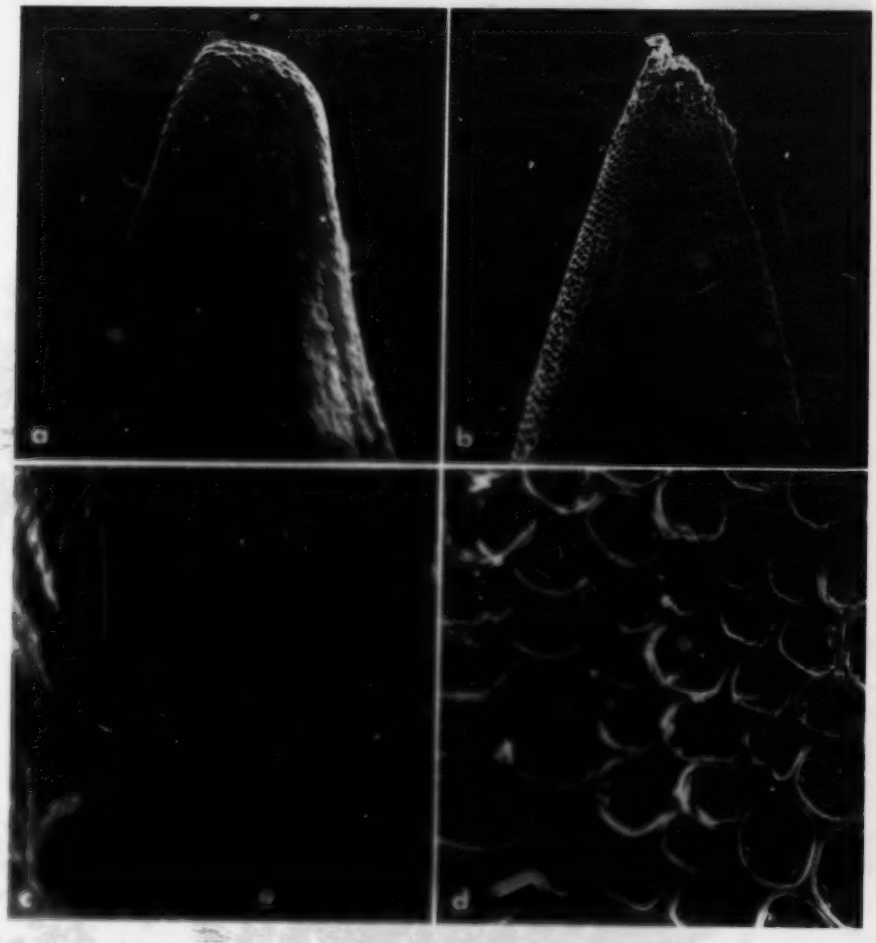

FIG. 3.—Detail of female anthecium, *Olyra buchtienii*: *a*, apex, dorsal side (× 50); *b*, apex of palea showing rounded excavations (× 100); *c*, dorsal base of the anthecium showing germination lid (× 40); *d*, detail of the excavations of the palea (× 700). Micrographs *a–c* of *Buchtien 1157* (US) and *b,d* of *Buchtien 40* (US). (Reduced to 72% of indicated magnifications for publication.)

FIGURE 4.—Distribution of *Olyra buchtienii*, *O. caudata*, *O. glaberrima*, and *O. holttumiana*.

margins; auricles membranous, glabrous; ligules membranous, conspicuous, 3–5 mm long, brownish, glabrous; pseudopetiole 0.4–0.6 cm long, dark brown, sparingly pubescent or more frequently glabrous; blades lanceolate, 20–30 cm long, 3.5–7.3 cm wide, narrowing from an asymmetric base to a symmetric, subulate apex, glabrous on both surfaces, the margins scabrous, the midnerve prominent. *Inflorescences* umbelliform on the upper nodes; panicles lax, ~12 cm long, 15 cm wide, the branches spreading, conjugate to verticillate from the base of the panicle, with male spikelets in pairs on short pedicels, the pedicels congested in fascicles of 6–8 and alternate on either side of a triquetrous axis, 1 or 2 terminal female spikelets on each branch; pedicels of the male spikelets short-hispid, those of the female spikelets thickened, 0.6–3 cm long, triquetrous, flattened toward the base, scabrous to short hispid; *main axis* hispid to scabrous, the axils of the branches dark brown, hispid. Axillary panicles similar to the terminal one. *Female spikelets* ellipsoid, subulate apically, 28–38 mm long, 3.6–3.9 mm wide, both glumes longer than the anthecium; *lower glume* long subulate to aristate apically, 9–15-nerved, pubescent to hispid on the outer surface, densely hispid on the inner surface with short hairs; *upper glume* subulate to aristate apically, 20–29 mm long, 7–9-nerved with transverse veinlets, pubescent to hispid on the outer surface,

with short appressed hairs on the inner one; *anthecium* lanceolate, acute apically, ~10.7 mm long, 3.3–3.5 mm wide, glabrous, smooth and shining, whitish to stramineous, with rounded excavations on the apex of the palea. *Male spikelets* lanceolate, 4.9 mm long, 1–1.2 mm wide, 1/7 or less as long as the female spikelets, short- to long-hispid; *lemma* acute, 3-nerved, short-hispid on the outer surface, otherwise glabrous; *palea* 3.5–4.8 mm long, 2-nerved, sparingly hispid to glabrous; anthers 3, 2–4 mm long.

DISTRIBUTION.—Only known from Bolivia, in lowland forests of the Department of La Paz (Figure 4).

ADDITIONAL SPECIMENS SEEN.—BOLIVIA, LA PAZ: San Carlos, *Buchtien 40* (NY, US); valley between Tipuani and Apolobamba, *Weddell 4581* (US). Nor Yungas, 13.5 km above San Pedro, *Gentry and Solomon 44515* (MO, US).

DISCUSSION.—*Olyra buchtienii* resembles *O. latifolia*, *O. caudata*, and *O. holttumiana*, from which it differs by the presence of noticeably umbelliform inflorescences similar to those of *O. obliquifolia* and the panicles with all branches whorled and reaching nearly the same height. The male spikelets are smaller than in these related species, measuring only about 1/7 the length of the female spikelets, and are borne in discrete fascicles along the panicle branches, a distinctive character not seen in other species in the genus.

3. *Olyra caudata* Trinius

FIGURES 4, 5

Olyra caudata Trinius, 1836:292. [Type: "Peruvia, in sylvis densis, Tocache." Holotype, LE, not seen; fragment of the holotype, US sheet no. 2877958.]

Olyra dimidiata Hochstetter ex Steudel, 1853:36. [Type: "(Hrbr. *Hostm.* nr. *786a*). Surinam." Holotype, P, not seen; fragment of the holotype, US sheet no. 2877957.]

Olyra pittieri Hackel, 1901:461. [Type: "Costa Rica: in planitie silvatica Cardoncellol (Cordoncillal, near Río Angel, Prov. Heredia), *Pittier 3639*." Holotype, W, not seen, fragment of the holotype, US sheet no. 2877933; isotype, MO.]

Cespitose perennials forming dense clumps, with thick adventitious roots. *Culms* erect, branching at the upper nodes, cylindrical, 1–2.5 m tall, arcuate; nodes thickened, short-pilose. *Leaves* with sheaths pubescent or densely papillose-pilose to glabrous, the margins short-ciliate; auricles present, membranous; ligules membranous and short-ciliate at the apex, conspicuous, 5–10 mm long, pubescent on the abaxial surface, the adaxial surface glabrous, smooth; pseudopetiole 0.5–0.8 cm long, brownish, short to densely pilose on its surface; blades ovate-lanceolate, 18–30 cm long, 6–10 cm wide, greenish, asymmetric and narrowed basally, symmetric and acuminate apically, short-pilose to scabrous, with a prominent midnerve and scabrous margins. *Panicles* umbelliform, lax, diffuse, 15–20 cm long, 10–20 cm wide, the lower branches whorled, spreading and reaching approximately the height of the upper ones, these alternate or verticillate, the male spikelets on short pedicels below, with the pedicels paired or in fascicles along either side of a triquetrous axis, a single terminal female spikelet on each branch; main axis longitudinally ridged, scabrous, the axils of the branches densely pilose, the axis of the branches triquetrous, with one side flattened; pedicels of the male spikelets thin, short-pilose to scabrous, those of the female spikelets thickened, scabrous to short-pilose. Axillary panicles usually present, similar to the terminal one. *Female spikelets* ovoid, long-subulate apically, 30–48 mm long, 4.5–5.5 mm wide, the glumes subequal and longer than the anthecium (4:1); *lower* and *upper glume* long-subulate with a geniculate awn 20–30 mm long, 9-nerved with transverse veinlets, densely pilose on the inner surface, especially toward the apex, short-pilose on the outer surface; *anthecium* ovoid, acute apically, 8.2–10 mm long, 4–5.2 mm wide, stramineous, brownish to olivaceous at maturity, smooth and shining, glabrous, shortly stipitate at its base, the stipe ~0.4 mm long; *lemma* with prickle hairs on the upper margins; *palea* pitted toward the apex and on the basal margins. *Caryopsis* ovoid, brownish, 6–6.8 mm long, 3.2–3.8 mm wide; hilum linear, reaching the entire length of the caryopsis; embryo 1/6–1/7 the length of the caryopsis; germination lid rounded. *Male spikelets* lanceolate, brownish, 4–6.6 mm long, 0.7–1 mm wide, hispid; *lemma* short-aristate, 3–5-nerved, hispid, more so toward the apex and margins; *palea* 3.2–5.8 mm long, 2-nerved, sparingly pilose toward the middle, otherwise glabrous; anthers 3 mm long.

DISTRIBUTION.—Mesoamerica (Costa Rica and Panama) and the West Indies (Trinidad) to South America (Colombia, Venezuela, Surinam, Guyana, Peru, Bolivia, and Brazil), in forests between 150 and 1100 m elevation (Figure 4).

ADDITIONAL SPECIMENS SEEN.—BOLIVIA, COCHABAMBA: Cantón Chuquioma, Campamento Isarsama de la UMSS al río del mismo nombre, *Beck 1562* (US).

BRAZIL, ACRE: Aldeota between Parangaba and Papagaio, *Maas et al. P13110* (F, US); Rio Branco, Colônia Penal, *Emygdio 1815* (R, US); Rio Branco, Zoobotanical Garden of the Universidade Federal do Acre, *Lowrie et al. 152* (MO). AMAZONAS: Near Três Casas, *Krukoff 6529* (F, MO, NY, US); Serra dos Surucucus, *Prance et al. 10168* (US). MATO GROSSO: Rio Aripuanã, Estrada Sta. Elena, *Cordeiro 127* (US); Paças Novas, afluente do Mamoré, *Kuhlmann 513* (RB, US). PARÁ: Parque Indigena do Tumucumaque, Rio Parú de Oeste, Missão Tiriyo, *Cavalcante 2334* (MO, US); Rio Vermelho, Serra do Cachimbo, BR 163 Cuiabá-Santarém, km 867, *Silva et al. 209* (MO, US), km 887, *Prance et al. 25311* (MO, US). RONDÔNIA: Entre Cururú y Vilhena, *Kuhlmann 1864* (RB). RORAIMA: Serra dos Surucucus, NW of Mission Station, *Prance et al. 10168* (US).

COLOMBIA, CAQUETÁ: 16 km from Florencia toward Belém, *Luteyn et al. 4899* (MO, US); Río Ortezuaga, Metucha, *Woronow 6060* (US); Nova Granada, Salitre, *Andre 1141* (US).

COSTA RICA, LIMÓN: A few km west of Bribrí, *Gómez et al. 20316* (CR, WIS). SAN JOSÉ: Vicinity of El General, *Skutch 4238* (NY, US).

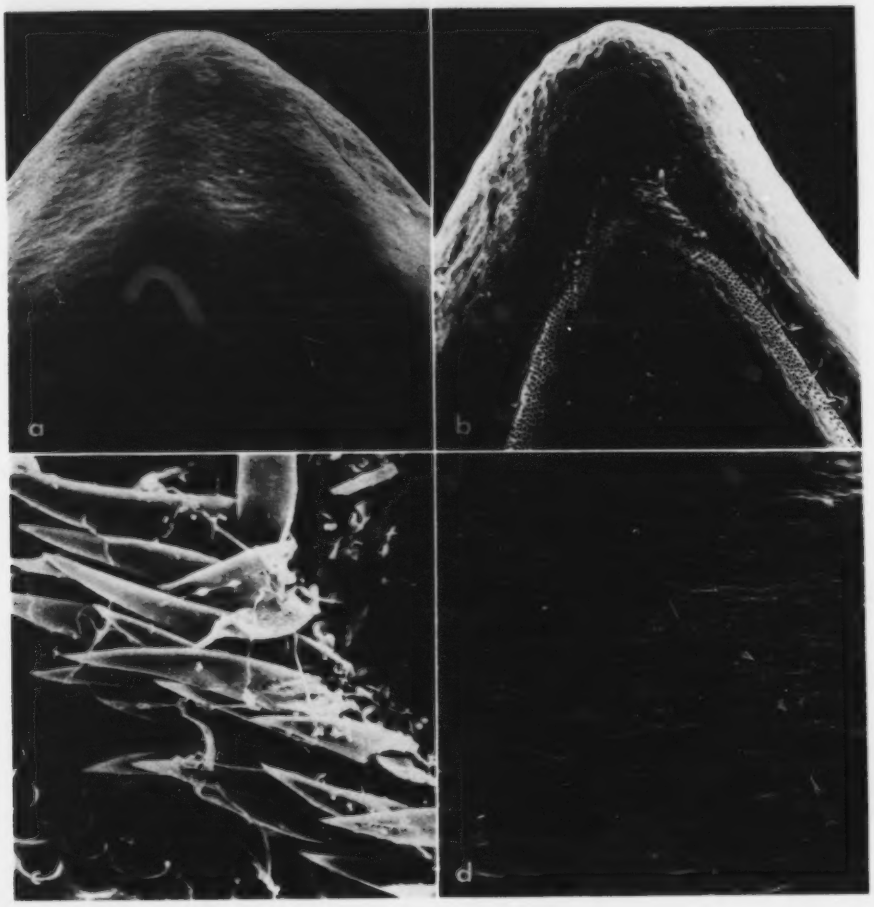

FIGURE 5.—Detail of female anthecium, *Olyra caudata*: *a*, apex of the anthecium, dorsal side (× 50); *b*, apex of the anthecium, ventral side (× 50); *c*, detail of macrohairs on the margins of the lemma (× 500); *d*, surface of the lemma (× 200). Micrographs *a*, *d* of *Allard 20195* (US), *b*, *c* of *Krukoff 6529* (US). (Reduced to 77% of indicated magnifications for publication.)

GUYANA: New Cabalebo, Courantyne River, *Jenman 134* (US).

PANAMA, COCLÉ: 16.7 km north of turnoff to Coclesito from Llano Grande, *Hammel 1857* (MO, US); forest around Limón, *Folsom 5835* (MO). DARIÉN: Cerro Pirre, *Bristan 577* (MO), *Gentry and Clewell 7119* (MO), *Mori and Kallunki 5447* (MO); vicinity of gold mine at Cana, *Croat 37649* (MO).

PERU, AMAZONAS: Alrededor de la comunidad Kusu, Río Numpatkin, *Ancash 76* (F, MO, US); quebrada Kayamas, Cenepa, *Ancash 171* (F, MO, US); vicinity of Quebrada Shimpunts, near upper Río Cenepa, *Berlin 881* (F, MO, US), *Kayap 1265* (F, MO); trail N of Cenepa to Tuhushiku Creek, *Berlin 1850* (F, MO, US). HUÁNUCO: Cueva de Las Lechuzas, cerca de Tingo María, *Ferreyra 13222* (US); Tingo María, *Asplund 12308* (R, US), *Allard 20915, 22583* (US); al este de Tingo María, cerca al Cerro Quemado, *Schunke 10127* (U). LORETO: Padre Abad, *Schunke 5468* (MO); Yurimaguas, lower Río Huallaga, *Killip and Smith 27975* (F, NY, US); al este de Tingo María, cerca al cerro Quemado, *Schunke 10127* (U); without locality, *Ule 6299* (US). MADRE DE DIOS: Tambopata Nature Reserve, *Barbour 4786* (MO); 39 km SW of Puerto Maldonado, *S.F.Smith et al. 160, 551* (US). SAN MARTÍN: Carretera al Río Tocache, *Plowman and Schunke 7461* (F, US), *Schunke 3587* (F, MO, US); Santa Rosa de Mishollo, *Schunke 6804* (F, MO, US); puente de Río Uchiza, *Schunke 7719* (WIS); Quebrada de Ishichimi, cerca de Tocache, *Schunke 10045* (F, MO, U); trail up Río Huallaga Valley toward Limón, *Gentry et al. 25552* (F, MO); trail to Schunte, 10 km W of Tocache Nuevo, *Plowman et al. 11368* (F, MO, US).

SURINAM: Maratakka River, without collector, Jan 2, 1915 (US 1914625); Paramaribo, *Wullschlaegel s.n.* (US).

TRINIDAD: Cedros, *Broadway s.n.*, Nov 4, 1916 (US); without locality, *Fendler 967* (US).

VENEZUELA, APURE: Selva de Cutufí, between Cutufí on the Río Cutufí and the Río Sanare, *Davidse and González 21724* (MO). BOLÍVAR: Near Campamento Las Pavas, *Steyermark 117188* (MO). MONAGAS: La Hormiga area, between La Pica and Caño Colorado, E of Maturín, *Wurdack and Monachino 39482* (NY, US). TÁCHIRA: Slopes of Cerro of Cuchilla La Pabellana, W of San Joaquina de Navay, *Steyermark 119386* (MO).

DISCUSSION.—The female spikelets of *Olyra caudata* resemble robust, long-awned versions of those of *O. latifolia*. As in *O. latifolia*, the female glumes disarticulate early, completely exposing the anthecium, which becomes brownish to olivaceous at maturity. Davidse (1987) has postulated that the florets "may mimic edible berrylike fruits that are eaten by frugivorous birds." As in some other species of the genus, a short internode is present at the base of the anthecium.

4. *Olyra ciliatifolia* Raddi

FIGURES 6, 15

Olyra ciliatifolia Raddi, 1823:19. [Type: "prope Rio Janeiro." Holotype: PI, not seen, fragment of the holotype, US sheet no. 2879005.]

Olyra cuneatifolia Desvaux, 1831:210. [Type: "Reperitur in Brasilio." Holotype, P, not seen, fragment of the holotype, US sheet no. 2877953.]

Perennial in cespitose clumps with 10 to 20 culms in a fascicle. *Culms* erect-ascending, geniculate or not at the lower nodes, 50–130 cm tall, unbranched; internodes hollow, shortly pubescent with retrorse, whitish and appressed hairs; nodes purplish, shortly pilose and thickened. *Leaves* with sheaths mottled, sparsely pilose with short whitish hairs to glabrescent, the margins ciliate, more so toward the tip; ligule membranous-ciliate, small, 0.4 mm long; pseudopetiole 0.2 cm long, stramineous to greenish, pilose, the borders long-ciliate to scabrous; blades ovate-lanceolate, 9–24 cm long, 3.6–8.5 cm wide, ascending, asymmetric and truncate basally, the apex symmetric and acuminate, the margins ciliate, both surfaces scabrous, the midnerve prominent toward the base. *Inflorescences* borne at the uppermost nodes, long-exserted in hispid peduncles, paniculiform; panicles pyramidal, lax, 9.5–19 cm long, 3.5–10 cm wide, the lower branches whorled and with male spikelets paired, one short, the other long-pedicelled on spreading tertiary branchlets, the upper ones alternate and with male spikelets on pairs below and a single terminal female spikelet on each branch; axis longitudinally ridged, hispid to scabrous, the branches and branchlets slender, triquetrous, scabrous; pedicels of the female spikelets thickened, smooth, glabrous. *Female spikelets* lanceolate, aristate, 11.6–23 mm long, 1.8–3 mm wide, the glumes unequal; *lower glume* ~10–12 mm long, pilose on the apex of the inner surface and toward the outer margins, otherwise glabrous, 5–7-nerved with transverse veinlets, long-aristate with the awn scabrous; *upper glume* acuminate, 7.7–10.2 mm long, with a pubescence similar to that of the lower glume, 5–7-nerved with transverse veinlets; *anthecium* fusiform, acuminate, 6.5–7 mm long, 1.6–3 mm wide, smooth and shining, whitish, dark at maturity with black spots, sparsely pubescent with long cylindrical, whitish macrohairs, more densely so toward the apex and base; *lemma* 5–7-nerved. *Caryopsis* long-ellipsoid, brownish, 4.3–5 mm long, 1.4–2 mm wide; hilum linear, reaching the entire length of the caryopsis. *Male spikelets* fusiform, 5.4–10.7 mm long, reddish to purplish, scabrous to shortly pubescent on the outer surface, aristate, awn ~3 mm long; *lemma* aristate, 3–5-nerved, sparsely pubescent toward the apex, otherwise glabrous; *palea* acute, 4.7–8.6 mm long, 2-nerved, sparsely pubescent toward the apex, otherwise glabrous, anthers 2.7–3.7 mm long.

DISTRIBUTION.—Colombia, Venezuela, Guyana, Brazil, Paraguay, Bolivia, and Argentina (Figure 15), often growing in disturbed places, from 100 to 1200 m elevation.

ADDITIONAL SPECIMENS SEEN.— ARGENTINA, CORRIENTES: Itatí, dense woodland on the bank of the River Paraná, *Pedersen 7013* (US); Perichón, *Quarín and González 3094* (US). MISIONES: Ruta 12, arroyo Aguaray Miní, *Fernández et al. 53* (US); arroyo Santo Pipó, *Schwarz 2595* (MO, US); Santo Pipó, *Schwarz 3445* (US, WIS); arroyo Yabebirí, *Schwarz 4530* (MO, US); Colonia Ñacanguazú, *Schwarz 1846* (MO); Corpus, *Schwarz 1928* (MO, US); Iguazú Falls, *Krapovickas and Cristobal 13701* (US); El Alcazar, *Schwindt 1456* (US); Loreto, *Ekman 675* (US), *Montes 1779* (F, US), *2047* (MO, US), *27410* (F, MO, US); Puerto Santo Pipó, *Schwarz 2641* (MO); Makako, *Schwarz 2917* (MO, US); Puerto Mani, *Schwarz 10295* (WIS); Puerto Aguirre, *Parodi 4395* (US); Puerto Iguazú, *Bridarolli 3619* (US); Puerto Leoni, *Schwarz 7699* (US, WIS); Puerto Mineral, *Schwarz 7579* (US); Cainguás, *Schwindt 592* (WIS); Santa María, *Montes 1645* (MO, US).

BOLIVIA, BENI: Huachi, head of Beni River, *White 1043* (F); Pampas near lake Rogagua, *Rusby 1669* (NY, US).

BRAZIL, ACRE: Beira do Rio Branco, ~5 km N de Boa Vista, *Black 51-13779* (IAN, US); without locality, *Ule 8047* (US). BAHIA: Rodovía BA-265, 6 km W of Caatiba, *Mori and Santos 11566* (MO, RB); 19 km N of Esplanada on road to Jaquera, *Calderón et al. 2411* (US). CEARÁ: Grangeiro Taboleiros, *von Luetzelburg 24257* (US). DISTRITO FEDERAL: altos do côrrego 'Mato Grande,' afluente margem esquerda do Ribeirão Papuda, *Filgueiras and Pereira 850, 851* (US); ~30 km S of Brasília, on road to Belho Horizonte, *Irwin and Soderstrom 5623* (US); Côrrego Landim, ~20 km NE of Brasília, *Irwin et al. 15679* (MO, US). Brasília, *Pires et al. 9324* (UB). GOIÁS: 12 km W of village of Presidente Kennedy, *Plowman et al. 8159* (MO); lower slopes of Serra Dourada, ~30 km E of Goiás Velho, *Irwin et al. 11868* (F, MO, US); 24 km NE of Catalão, *Irwin et al. 25106* (US); 75 km N of Corumbá de Goiás on road to Niquelândia, *Irwin et al. 19030* (F, MO, RB, US); Rio das Contras, Araguaina, *Irwin et al. 21121* (F, MO, US); ~9 km S of Guara, *Irwin et al. 21535* (US); between

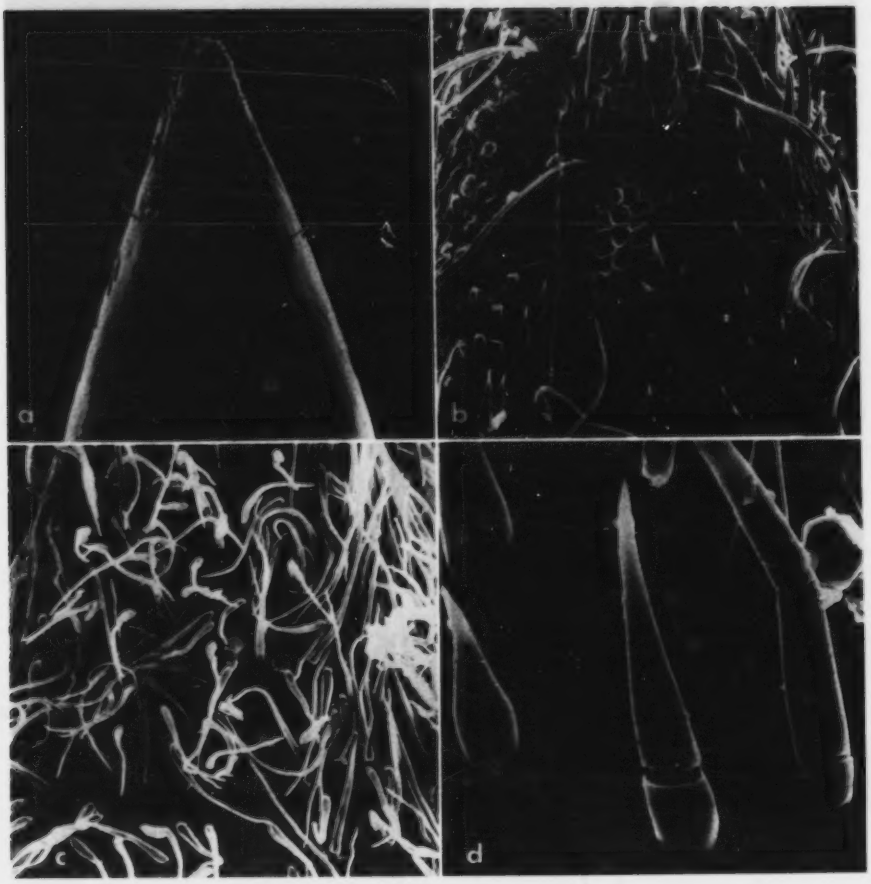

FIGURE 6.—Detail of female anthecium, *Olyra ciliatifolia*: *a*, anthecium, dorsal side (× 30); *b*, anthecium, ventral side showing the apex of the palea with rounded excavations and lemma (× 200); *c*, apex of the lemma showing cylindrical macrohairs (× 200); *d*, detail of a macrohair (× 1000). Micrographs *a,b,d* of *Chase 11146* (US), *c* of *Chase 11487* (US). (Reduced to 77% of indicated magnifications for publication.)

Itabira and Goiabeira, *Chase 11487* (US); between Viannápolis and Ponta Porá, *Chase 11318* (F, MO, NY, RB, US); Goyandira, *Chase 11575* (US); Santa Rita do Paranahyba, *Chase 12098* (US); vicinity of Goiabeira, *Chase 15022* (US); vicinity of Goiabeira, between Annápolis and Goiás, *Chase 11506* (F, MO, US); Santa Rita do Araguaya, on Rio Araguaya, *Chase 11818* (US). MARANHÃO: Castanhede, *Sucre 9386* (US); Caxias to Barra do Corda, *Swallen 3522* (NY, US), *3553, 3584* (US), *3555* (R, RB); Grajahú to Pôrto Franco, *Swallen 3774* (US); south of main house of Fazenda Morros, about 35 km south of Loreto, *Eiten and Eiten 3738A* (MO, NY), *4306* (F, NY, US), *10633* (US); between the rios Balsas and Parnaiba, about 40 km south of Loreto, *Eiten and Eiten 3827* (F, NY, US); 55 km due W of Barra do Corda, *Eiten and Eiten 10276* (US). Perizes, *Black et al. 54-16511* (IAN, US); Palmerinha, a 74 km de Tuntum, *Silva and Santos 712* (US). MATO GROSSO: Agua Quente, prope Palmeiras, *Lindman A2597* (US); along Rio São Lourenço, Barça, *Chase 11975* (US); between Rondônopolis and São Lourenço, *Chase 12001* (US); sitio do Dr. Alfredo Neder, *Sucre 10380* (RB); without locality, *H. Smith 206* (US). MATO GROSSO DO SUL: Dourados, Colônia Agricola Federal, *Swallen 9406* (US); Aquidauanã, *Chase 11059* (US); vicinity of Dourados, *Chase 10999, 11009* 1/2 (US), *11006* (RB, US); Urucum, Corumbá, on Rio Paraguay, *Chase 11146* (US). MINAS GERAES: Caldas, *Widgren 1215* (US); Faria, serra da Bocaina, *Chase 10539* (US); Fundão, *Macedo 1002* (US); Lavras, *Chase 8749* (F, MO, NY, RB, US), *8788* (US); along railway between Lavras and Formiga, *Dorsett 214b* (US); Serra do Cipó, km 100, *Chase 9291* (F, MO, NY,US); Serra do Cipó, in cleared field near Vaccaria, *Chase 9136* (F, MO, NY, US); Serra do Curral, Acaba Mundo, *Chase 8960* (F, MO, US); Barreiras, *Kuhlmann s.n.*, Feb. 20

1926 (US); Burity's, near Rio São Francisco, *Chase 10469* (F, MO, US); ~10 km NE of Francisco Sá, road to Salinas, *Irwin et al. 23143* (F, MO, US); ~5 km SE of Paracatú, *Irwin et al. 26191* (F, MO, US); between Urubú and Cambuhy, valley of Rio Anzol, *Dorsett 154b* (US); São Miguel, NW of Formiga, *Chase 10550* (NY,US); Santa Terezinha, *Macedo 1661* (RB, US); between Uberlândia and Río Paranahyba, *Chase 11617* (US); without locality, *Widgren 914* (R, US); Morro do Pau Lavrado, *Heringer 3800* (UB); 30 km from Paraopeba, *Heringer 5901* (UB). PARÁ: 20 km W of Redenção, near Córrego São João and Troncamento Santa Teresa, *Plowman et al. 8451* (F, MO). PARANÁ: Campo Morão, Río do Vargem, *Swallen 9001* (US); 7 km E of Londrina, *Swallen 8741* (US); Parque Nacional de Iguaçú, 9 km S of Jardinópolis along the road to Medianeiva, *Davidse et al. 11222* (MO, US), *Falção 100* (R); Rio Ivaí, *Hatschbach 15729* (US); 6 km SE of São Luis, *Davidse et al. 11214* (MO). PIAUÍ: entre Piaba e Barrinha, *Sucre and Silver 9428* (US). RIO DE JANEIRO: Serra do Barata, represa do Piraquara, *Soderstrom and Sucre 1921* (CEPEC, RB, US), *1922* (CEPEC, US), *Sucre 7485* (RB). RORAIMA: 5 km ao N de Boa Vista, *Black 51-13779* (US); proximo a boca do Igarapé Iguapirá, *Pires et al.* 14-633(103) (US). SÃO PAULO: Fazenda Capi, *Clayton 4603* (US); Fazenda of Lauro Toledo, 1 km W of Rio São Mateus, *Clayton 4576* (US); Fazenda São José, 1 km W of Río São Mateus, *Eiten et al. 5889* (MO, US); Itapira, *Hoehne 20338* (US); Nova Europa, *Hoehne 13657* (US); Parque do Estado, São Paulo, *Clayton and Eiten 4186, 4188* (US); Ribeirão Preto, *Lofgren 1544* (US). STATE AND LOCALITY UNKNOWN: *Gardner 3523* (US), *Sellow*, Brasil (US), *Pohl*, Brazil (US), *Glaziou 14397* (US).

COLOMBIA, CAQUETÁ: 16 km from Florencia toward Belém, *Eiten and Eiten 10633* (MO). META: Ranch Menegua, about 100 km SE of Villavicencio, *Schiefer 795* (GH, US); without locality, *Moritz 685* (US).

GUYANA: Without locality, *Schomburgk 703* (US).

PARAGUAY: In regione lacus Ypacaray, *Hassler 12444* (F, NY, US), *13021* (US); Pedro Juan Caballero, *Morong 505* (MO, NY, US); Villa Elisa, *Pedersen 5909* (US); Estancia La Soledad, Santiago, *Pedersen 3200* (MO, US); Cordillera de Altos, *Fiebrig 480* (F, GH); Trinidad, *Rojas 3071* (US); Villa Rica, *Jorgensen 4098* (F, GH, MO, NY, US); in regione cursus superioris fluminis Apa, *Hassler 8194* (NY); without locality, *Anderson 1185* (US), *Balansa 258* (US), *Hassler 1587* (NY).

TRINIDAD: Port of Spain, Botanical Garden, *Hitchcock 10133* (US); without locality, *Broadway 1918* (NY, US), *5085* (MO), *9194* (US), *Fendler 968* (NY), *Purdie 26* (US).

VENEZUELA, BARINAS: Ticoporo forest reserve, *Breteler 4015* (US). BOLÍVAR: Near El Dorado, *Irwin et al. 25106* (MO); 1 km N of Paragua, *Liesner and González 5755* (US). GUÁRICO: Altagracia de Orituco-Taguay (carretera hacia Carmen de Cura), *Aristiguieta and Agostini 6439* (US).

DISCUSSION.—This is one of the commonest species in eastern Brazil, flowering between January and May. There are only female spikelets on the axillary panicles of *Eiten and Eiten 3827* and *4306* from Brazil. Hunziker et al. (1982) have recorded a chromosome number of n = 11 for the species. The common name is recorded as "paja carruzo" in Venezuela.

5. *Olyra ecaudata* Doell

FIGURES 7, 8*a,b*, 34

Olyra ecaudata Doell in Martius, 1877:326. [Type: "In Guiana gallica (*Leprieur* n. 547)." Holotype, P, not seen, fragment of the holotype, US sheet no. 2877952.]

Robust perennials with large dense clumps of up to 50 culms. *Culms* up to 3 or 4 m tall, from a thick, short-rhizomatous base, geniculate-ascending and bearing fully developed leaves only toward the top, 5 or 6 of these ascending in a cluster, with the flowering culms usually separate from the vegetative ones; vegetative culms erect; flowering culms bladeless, to 2 m long; internodes thick, hollow, short-pubescent with whitish hairs to glabrous; nodes geniculate, thick, prominent, formed of the thickened basal rim of the sheath above and the thickened upper rim of the internode below, flared, dark brown and with retrorse hairs to glabrous. *Leaves* 5–7 per complement, clustered above the naked culms; sheaths with flattened, caducous, and brownish hairs along the overlapping margins, the rest of the surface sparsely pilose to glabrous; ligule a tiny brown membrane, 0.6–1.1 mm long, shortly ciliate at the tip; pseudopetiole dark brown, 0.3–0.5 cm long, with brown, thick, flattened hairs on the adaxial surface, the abaxial surface with or without these hairs; blades ovate-lanceolate, 21–35 cm long, 5–7.5 cm wide, rigid, dark green, fully developed on the upper nodes, gradually narrowed above to an acute or acuminate, symmetric tip and slightly cordate, symmetric at the base, glabrous on both surfaces to sparsely pilose on the adaxial surface, the midnerve prominent, the basal margins short-ciliate, otherwise scabrous to completely glabrous. *Inflorescences* paniculiform, 2 or 3 from each of the uppermost nodes, some inflorescences short and found only at the base of the plant; panicles 10–20 cm long, 10–25 cm wide, the lower branches verticillate, the upper ones alternate to opposite, stiffly spreading, the individual branches up to 15 cm long, usually with 2–6 female distal spikelets and below with male spikelets on short branchlets or in pairs, one long- and the other short-pedicellate, the panicles exserted on long, glabrous to sparsely pubescent peduncles; *axis* and branches sparsely hirsute, longitudinally ridged, scabrous, the axils of the branches densely pilose. *Female spikelets* ovoid, acuminate to occasionally shortly aristate, 8–11.6 mm long, 3–3.8 mm wide, the glumes subequal or the lower glume occasionally a little longer than the upper one, sparsely pilose toward the margins and nerves on the outer surface, shortly pilose toward the apex on the inner surface; *lower glume* apiculate to shortly aristate, 5–10-nerved with transverse veinlets; *upper glume* apiculate, 7–11-nerved with transverse veinlets; *anthecium* ovoid, 6.6–8.3 mm long, 2.7–3.4 mm

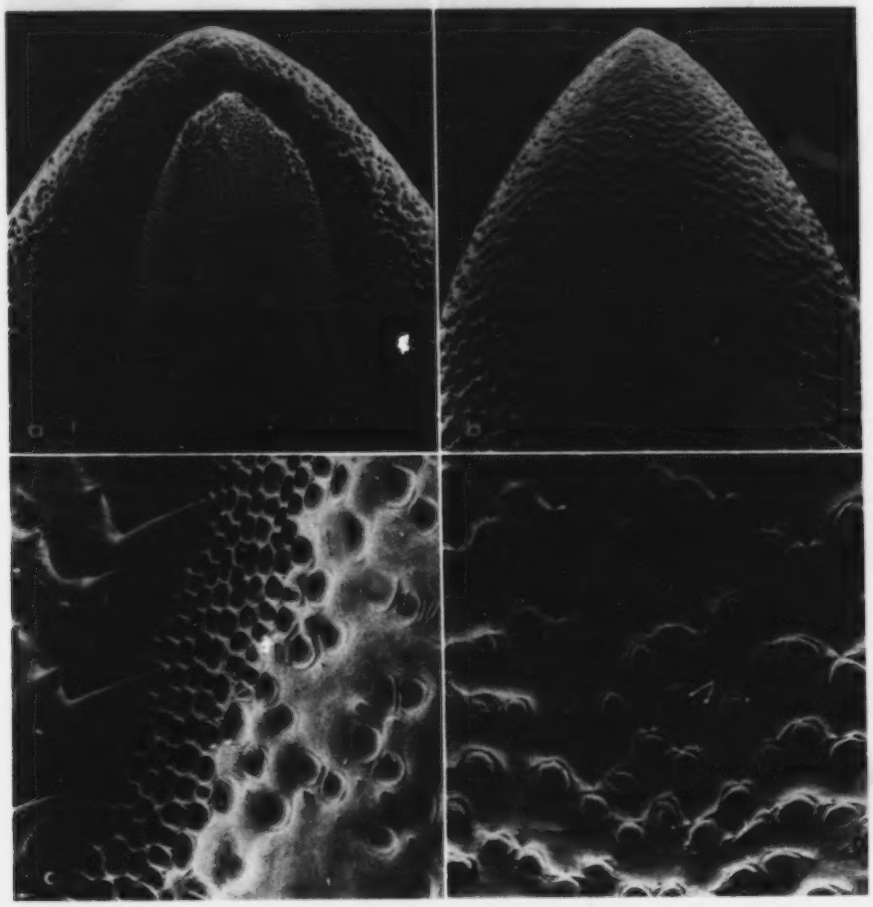

FIGURE 7.—Detail of female anthecium, *Olyra ecaudata*: *a*, anthecium, ventral side (× 50); *b*, anthecium, dorsal side (× 30); *c*, margin of the lemma with prickle hairs and palea with rounded excavations toward the margins (× 200); *d*, surface of the lemma with excavations (× 200). Micrograph *a* of *Cremers 4478* (US), *b-d* of *Soderstrom & Calderón 2292* (US). (Reduced to 77% of indicated magnifications for publication.)

wide, indurate, whitish, with small excavations all over the lemma and palea; *lemma* 7- or 8-nerved, the margins with conspicuous, rigid, and long prickle hairs; *palea* 4-nerved and with rounded excavations toward the apex and upper margins. *Caryopsis* ellipsoid, brownish, 4.8 mm long, 2.2–2.6 mm wide; hilum reaching the entire length of the caryopsis. *Male spikelets* lanceolate, aristate, 7.5–11 mm long, 0.6–1 mm wide, greenish, glabrous to scaberulous; *lemma* 3-nerved, aristate, the awn 5 mm long; *palea* 2-nerved; anthers yellow, 3.3–4.3 mm long.

DISTRIBUTION.—Ranging from Costa Rica and Panama in Mesoamerica to Colombia, Venezuela, Surinam, French Guiana, Peru, Bolivia, and Brazil in South America (Figure 34); growing in primarily humid forests, generally at elevations below 500 m, although *Smith 2700* from Peru was collected at 2000 m.

ADDITIONAL SPECIMENS SEEN.—BOLIVIA, PANDO: Cobija, *Ule 9146* (US).

BRAZIL, ACRE: About 80 km from Rio Branco on road to Xapuri, *Calderón and Soderstrom 2292* (US); 125 km from Rio Branco on road to Pôrto Velho, *Calderón and Soderstrom 2305* (US); 8°54′S–72°51′W, *Calderón and Soderstrom 2353* (US). BAHIA: Bahia State Highway 2, 7 km N of Ibirataia City, Fazenda Santo Antonio, *Calderón and Pinheiro 2223* (CEPEC, US, WIS), *2259* (US); Parque Nacional Monte Pascoal, 14 km E of BR-101, 13 km N of Itamarajú, *Soderstrom et al. 2197, 2199* (CEPEC, US). ESPÍRITO SANTO: Reserva Florestal da Companhia Vale do Rio Doce, *Luna Peixoto 416* (RB, US). MATO GROSSO: Fazenda Cachimbo, *Cordeiro 1132* (MO). PARÁ: Alto Tapajós, Vila Nova, perto da Cachoeira do Chacorão, *Pires 3951* (IAN, US); Belém, Floresta do Utinga, *Pires 1432* (US); Castanhal, Colônia 3 de Outubro, *Fróes*

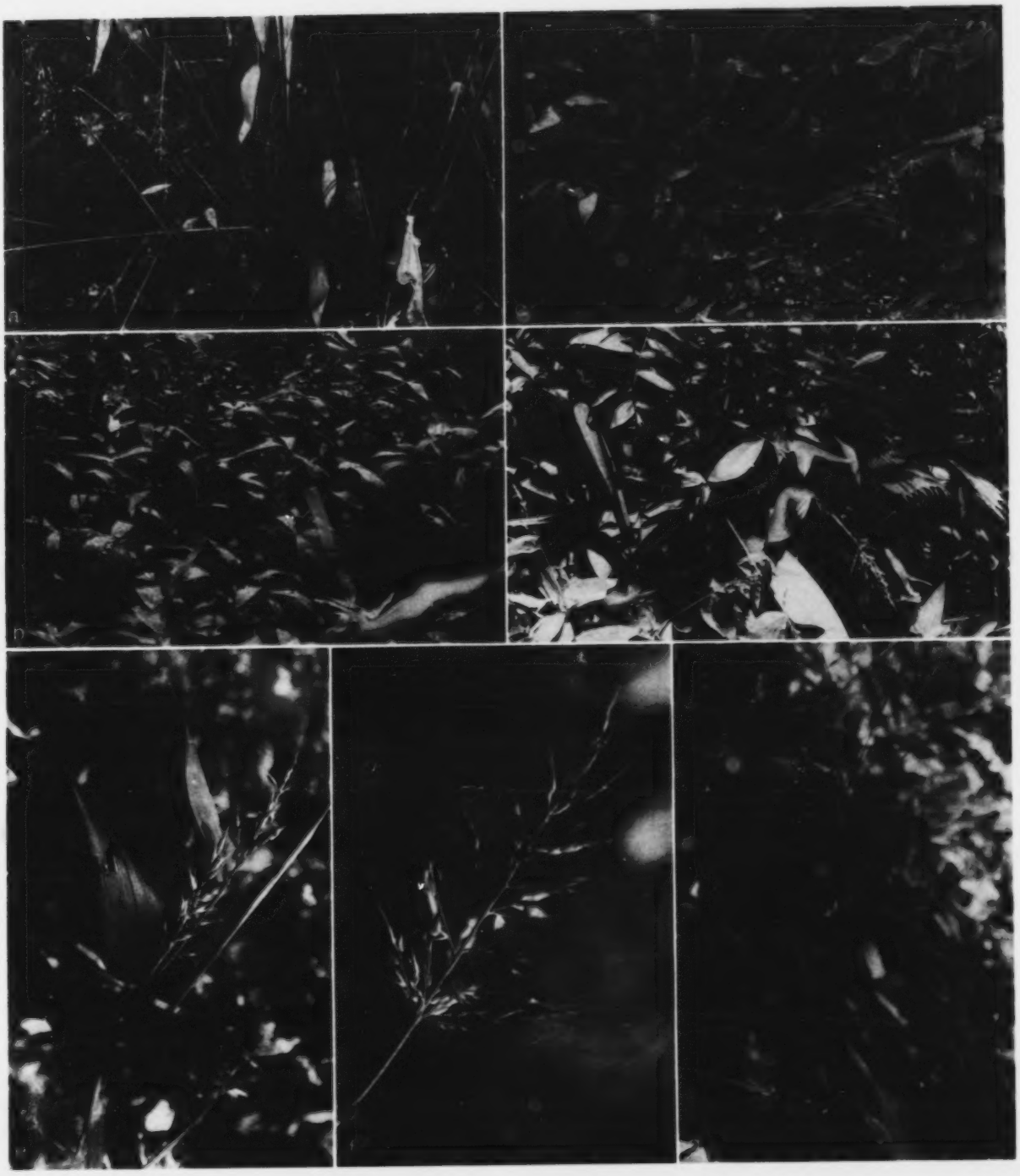

FIGURE 8.—Field photos of *Olyra* species. *Olyra ecaudata*: *a*, habit of plant (Brazil, 1972) showing dying culms after flowering; *b*, habit of plant showing plants before flowering. *Olyra fasciculata*: *c*, habit of plant (Brazil, 1968); *g*, detail of panicle. *Olyra latifolia*: *d*, habit of plant (Costa Rica, 1968); *e*, upper nodes with inflorescence; *f*, detail of panicle. All photographs by C.E. Calderón.

24873 (US), *Black 49-8609* (US); 50–65 km N of Gurupí, Belém-Brasília, *Prance and Silva 58683* (US); Serra dos Carajás, Azul, near camp at Serra Norte, *Daly et al. 1937* (US). RONDÔNIA: Pôrto Velho, *Silva 391* (US); Rio Contra, 6 km from Jaciparaná, *Calderón et al. 2814* (US, WIS).

COLOMBIA, VAUPÉS: Confluence of Macaya and Ajajú rivers, Puerto Hevea, *Grassl 10019, 10029* (US).

COSTA RICA, Borders of SAN JOSÉ and PUNTARENAS: Río Convento, on the Pacific slope, *Dodge et al. s.n.* (CR).

FRENCH GUIANA: Sur le Tampoc, Saut Koumakou Soula, *Cremers 4478* (US); without locality, *Leprieur 547* (US).

PANAMA, DARIÉN: Along ridge N of Ensenada El Guayabo that separates the Río Jaque Valley from the Pacific Ocean, *Knapp and Mallett 3181* (MO, US). PANAMÁ: Cerro Azul, 6–10 km del lago Goofy, *Calderón 2087* (US), *Croat 17289* (MO, US), *Soderstrom 2003* (MO, US); Cerro Jefe, *Calderón and Dressler 2122* (US); Zetek Trail 2100, Barro Colorado Island, *Judziewicz 4437* (MO, US, WIS).

PERU, LORETO: Bosque Nacional de von Humboldt, region of San Alejandro, *Gentry and Revilla 16200* (MO, WIS). PASCO: 19 km W of Oxapampa, *D. Smith 2700* (MO, US).

SURINAM: 3 km S of Juliana Top, 12 km N of Lucie Rivier, *Irwin et al. 55055* (US); vicinity of Kayser airstrip, 25 km above confluence with Lucie River, *Maguire et al. 53950* (US); entre Hanover Savannah et Para, *Hoock 93* (NY, US); ~2 km below affluence of Oost Rivier, *Maguire et al. 54095* (MO, US); near Brownsweg along railway, *Wessels Boer 641* (US).

VENEZUELA, ZULIA: 3 km E of the Río de Oro settlement on the Río de Oro, *Davidse et al. 18620* (MO, US).

DISCUSSION.—*Olyra ecaudata* forms large clumps to ¾ m in diameter, of tall erect culms reaching 3–4 m in height, and is found only in shaded areas of good, often primary, forest, flowering between October and July. The full-sized leaves develop only on the upper nodes where 4–6 ascending blades are clustered, creating a plume-like effect. Generally the flowering culms are borne separately from the sterile ones and bear only bladeless sheaths at their nodes. Calderón noted on the label of one of her specimens (*Calderón and Dressler 2122*) that the plants on Cerro Jefe in Panama were all sterile. Dressler, who had visited the locality over the years, remarked that the colony had never been in flower as long as he visited it. Two years later I visited the locality in his company and the entire colony was in flower with the plants dying (see specimen of *Soderstrom 2003* from here). This same phenomenon was noted in plants collected in Bahia, Brazil (*Soderstrom et al. 2197*) and on Barro Colorado Island, Panama (Judziewicz, 1983, pers.comm.). All plants of this species had flowered and died in the region. In this case both tall and short inflorescences were found, as in another specimen from Acre, Brazil (*Calderón and Soderstrom 2353*). A possible explanation is that the plant remains sterile for many years and at time of flowering the tall mature shoots flower as well as new small shoots that have developed from a weakened base.

Flowering culms with fully developed leaves (*Soderstrom 2003* from Panama and *Fróes 24873* from Pará, Brazil) are rarely encountered in herbarium specimens.

6. *Olyra fasciculata* Trinius

FIGURES 8c,g, 9, 11

Olyra fasciculata Trinius, 1834:25 [page 113 in published form, 1835]. [Type: "V. spp. Bahiens." Holotype, LE, not seen.]

Olyra heliconia Lindman, 1900:11, pl. 6. [Type: "Habitat in Brasilia centr., Matto Grosso, Matto do Curupira, in silva primaeva, mens. Febr. florens, Exp. I. *Regnell., A., 3017.*" Holotype, S, not seen; fragment of the holotype, US sheet no. 2877949.]

Perennial, short-rhizomatous grass, in cespitose clumps with 20–50 culms in a fascicle, usually leaning on trees or shrubs. *Culms* erect, branching on the upper nodes, 1.5–3 m tall; internodes hollow, glabrous, cylindrical, up to 1 cm in diameter, the lower internodes with a sheath only or with a rudimentary or reduced blade; nodes glabrous, thickened, purplish. *Leaves* with sheaths short-pilose with retrorse hairs to glabrous, greenish to pale, the margins short-pilose to glabrous; ligule membranous, short-ciliate at the apex, 1–4 mm long, pilose on the abaxial surface; pseudopetiole 0.4–1.3 cm long, purplish to black, short-pubescent on both surfaces; blades ovate-lanceolate, 24–32 cm long, 5–13.2 cm wide, ascending, narrowed from an asymmetric base to a symmetric or asymmetric tip, the basal margins short-ciliate, otherwise scabrous, the midnerve prominent, abaxial surface pilose toward the base, otherwise glabrous. *Inflorescences:* 2 or 3 borne on the uppermost nodes; terminal panicles 20–30 cm long, 16–25 cm wide, the branches divergent from the axis, drooping, the lowermost whorled and almost reaching the same length as the upper branches, 16–25 cm long, the upper ones alternate, sometimes 3–10 branches in one fascicle; peduncles densely pilose; *axis* longitudinally ridged, scabrous, the branches spreading, triquetrous, flattened on one side, hispid toward the base, otherwise scabrous, with 4–6 male spikelets borne alternately on short, scabrous branches on the lower portion and 1–5 female spikelets at the summit of each branch, the pedicels of the female spikelets thickened, pilose. *Female spikelets* lanceolate, greenish to brownish, 22–33 mm long, 2.9–3.2 mm wide, aristate or not, the glumes unequal and strongly nerved, pilose to glabrous; *lower glume* as long as the spikelet, acuminate to long-aristate, rigid, 5–9-nerved with transverse veinlets, the inner surface densely pilose to pilose only toward the apex, the outer surface pilose to scabrous toward the apex, otherwise glabrous; *upper glume* 17–20 mm long, acuminate to subulate apically, 7–9-nerved with transverse veinlets, with pubescence similar to that of the lower glume, *anthecium* fusiform, acute, 9–11.5 mm long, 2.5–2.8 mm wide, glabrous, pitted, with oblong excavations over the entire surface, stipitate, the stipe 0.8–1 mm long; *lemma* 5-nerved. *Caryopsis* fusiform, 6.8 mm long, 2 mm wide; hilum linear, reaching the entire length of the caryopsis. *Male spikelets* fusiform, 8–13 mm long, 0.7–1 mm wide, glabrous,

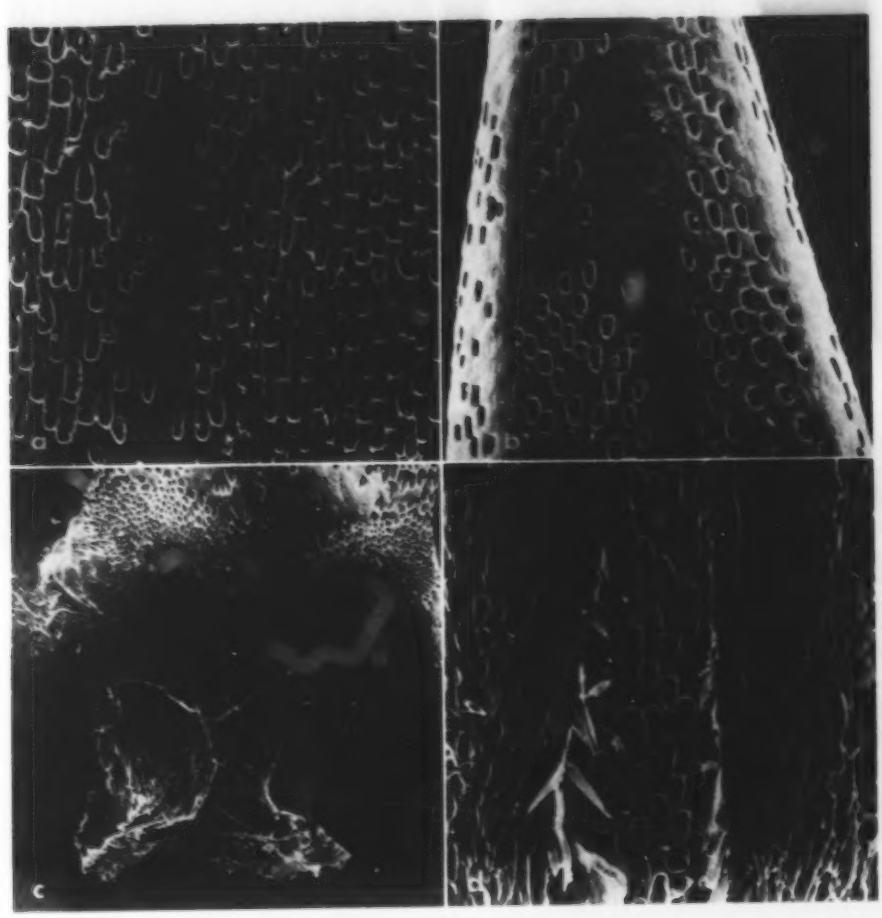

FIGURE 9.—Detail of female anthecium: *Olyra fasciculata*: *a*, surface of the lemma showing oblong excavations (× 100); *b*, anthecium, dorsal side (× 50); *c*, base of the anthecium showing stipe (× 50); *d*, anthecium, ventral side (× 200). Micrographs *a,c,d* of *Killip & Smith 23452*, *b*, of *Pereira 2294* (US). (Reduced to 77% of indicated magnifications for publication.)

pink to purplish; *lemma* acuminate apically, purplish, scabrous, 3-nerved; *palea* 7–10 mm long, 2-nerved, scaberulous; anthers 3, 7.6–8.5 mm long.

DISTRIBUTION.—Panama; South America from Peru and Bolivia to Brazil and northwestern Argentina (Figure 11); found on edges of forests, usually in full sun, between 200 and 1600 m elevation.

ADDITIONAL SPECIMENS SEEN.—ARGENTINA, SALTA: Quebrada del Acheral, *Castellanos 21* (LIL); Finca El Candado Grande, *Cuezzo and Legname 5728-C* (LIL); El Angosto del Río Pescado, *Meneses and Vervoorst 18* (LIL); Dept. Orán, Finca Yakulika, 1 km antes de Río Pescado, *Türpe 2790* (LIL, WIS); Río Pescado, 9 km de la finca Yaculika, *Vervoorst and Cuezzo 7841-C* (LIL).

BOLIVIA, BENI: Rurrenabaque, *White s.n.*, Aug 1921 (NY), *Beck 8219* (WIS); San Juan, *Williams 958* (NY). COCHABAMBA: Antahuacana, *Buchtien 6433* (US). SANTA CRUZ: Buena Vista, *Steinbach 2010* (GH, US); Ascensión de Guarayos, *Krapovickas* and *Schinini 31702* (US). LA PAZ: Coroico, *Hitchcock 22720* (NY, US); Polo-Polo bei Coroico, *Buchtien 450* (F, NY), *3622* (US), *3623* (F); Yungas, *Rusby 31* (NY), *Bang 508* (NY, US).

BRAZIL, ESPÍRITO SANTO: Vargem Alta, Fruteira, *Pereira 2294* (US). GOIÁS: Santa Rita do Araguaya, on Rio Araguaya, *Chase 12046* (US). MINAS GERAIS: Without locality, *Macedo 4274* (IAN, US). PARANÁ: Capão Bonito, *Dusen 18000* (MO, US); 7 km E of Londrina, *Swallen 8737* (US); Quatro Portões, *Pereira 7905* (F, RB, US), *Hatschbach 10519* (F, US); Maringá, Orto Florestal, *Hatschbach 12929* (F, US); Parque Nacional do Iguaçú, W bank of Rio Floriano, *Lindeman and Haas 3558* (US); Rio Ivaí, *Hatschbach 15720* (US). RIO DE JANEIRO. Rio de Janeiro, Avenida Niemeyer, *Chase 10003* (F,

MO, US); Leblón, *Rosengurtt PE-3386* (US); Pão de Açucar, *Chase 8404* (F, MO, NY, US), *9798* (US); Serra do Corcovado, Sumaré, *Calderón 2022* (US); Serra da Mendanha, 22°51′S, 43°32′W, *Soderstrom and Sucre 1952* (CEPEC, RB, US), *Sucre 6406* (RB, US); Strada de Gávea, próximo a São Conrado, *Calderón 2024* (RB, US); Vale de Bom Sucesso, "Caixa d'Agua," *Soderstrom and Sucre 1982* (CEPEC, RB, US), *Sucre 2004, 2204* (US), *Braga 1955* (RB). SÃO PAULO: Ubatuba, *Soderstrom and Sendulsky 1994* (US); without locality, *Regnell 239* (NY), *Burchell 954* (US), *Gardner 137* (US). SANTA CATARINA: Aguas de Chapecó, *Smith and Klein 13107* (R, US), *Reitz and Klein 16713* (US); Nova Teutónia, *Plaumann 459* (RB). STATE AND LOCALITY UNKNOWN: *Burchell 6709* (US), *Pohl s.n.* (US), *Riedel 160* (US), *934* (GH, US), *Spruce 4807* (US).

PANAMA, COLÓN: Headwaters of the Río Boquerón near fork with Río Nombre de Diosito, *Hammel 3951* (MO, US). SAN BLAS: El Llano-Cartí road, 9°19′N, 78°55′W, *de Nevers et al. 5254* (MO, US).

PERU, CUZCO: Cerro San Pedro, *Vargas 8498* (US); Quitemi, *Chavez Alfaro 3387* (MO). HUÁNUCO: Huánuco to Tingo María, km 100, Río Chinckao, *Seibert 2297* (MO, US); Puente Durand, N of Huánuco, valley of Chinckao River, *Stork and Horton 9574* (F, US), *Vargas 5388* (US); along road between Chinchao and Puente Durand, *McClure 21458* (US). JUNÍN: Colonia Perené, *Hitchcock 22056* (NY, R, US), *22070* (US); 28 km N of San Ramón, on road to Oxapampa, *Dillon and Turner 1439* (F, MO); La Merced, *Killip and Smith 23452* (US), *23788* (F, NY, US); Río Paucartambo, near junction with Río Perené, *Seibert 2194* (MO, US); San Ramón, *Killip and Smith 24755* (NY). SAN MARTÍN: Juan Jui, Alto Río Huallaga, *Klug 4197* (F, MO, NY, US); Lamas, *Williams 6449* (F, US); San Roque, *Williams 7792* (US); without department, Pozuzo, *Macbride 4572* (US); Santa Ana, *Cook and Gilbert 1653* (US); in montibus secus flumen Mayo, prope Tarapoto, *Spruce 480* (NY). STATE AND LOCALITY UNKNOWN: Andes, Peru, *Poeppig s.n.*, 1834 (US), *Gardner 137* (NY).

DISCUSSION.—*Olyra fasciculata* bears some resemblance to *O. obliquifolia* but can be distinguished by its paniculate inflorescence bearing longer female spikelets on less thickened pedicels. Common names include "tacuarilla" (Bolivia) and "taquaril" (Brazil). Chromosome numbers of 2n = 14 (Calderón and Soderstrom, 1973) and n = 7 (Hunziker et al., 1982) have been recorded. It usually flowers between October and April.

7. *Olyra filiformis* Trinius

FIGURES 10, 11, 17*a,b*

Olyra filiformis Trinius, 1834:27 [page 115 in 1835 published form]. [Type: "V. spp. Bahiens." Holotype, LE, not seen, fragment of the type, US sheet no. 2877951; isotype, GH.]

Cespitose perennials, short-rhizomatous, with 10–25 culms in a fascicle. *Culms* geniculate-ascending, occasionally decumbent and rooting at the lower nodes, climbing and arching, 40–125 cm tall, many-noded, unbranched, sparingly branching at the upper nodes; internodes cylindrical, hollow, sparingly pilose to glabrous, the lowest short, followed by two elongated internodes bearing a culm leaf without blade; nodes thickened, purplish, pilose with whitish retrorse hairs to glabrous. *Leaves* with sheaths strongly ribbed, greenish to purplish, the margins membranous, pilose toward the upper portion, otherwise glabrous; auricles conspicuous, membranous; ligule membranous, 0.5–1.8 mm long, glabrous on the adaxial surface, short-pubescent on the abaxial one; pseudopetiole ~0.2 cm long, pale to purplish, densely pilose; blades oblong-lanceolate, 11–14 cm long, 1.2–2.8 cm wide, narrowed and asymmetric at the base, the apex symmetric, scaberulous to scabrous on both surfaces, the abaxial surface short-hispid, the midnerve prominent on the abaxial surface, the margins scabrous. *Inflorescences* paniculiform, contracted, one to several on the upper nodes, long exserted, peduncles glabrous; panicles 5–10 cm long, 0.7–2 cm wide, the branches alternate, spaced and appressed to the axis, each branch with male spikelets below and a single terminal female spikelet; *axis* longitudinally ridged, scaberulous, the axis of the branches flattened, hispid to scabrous, the male spikelets in pairs or in short branchlets, one subsessile, the other short-pedicellate, the female spikelets on thick, short-pubescent pedicels. *Female spikelets* fusiform, 17–24 mm long, aristate, whitish, glabrous to scaberulous, the glumes unequal, the anthecium approximately 1/3 the length of the spikelet; *lower glume* as long as the spikelet, long-aristate, the awn ~6 mm long, 7–9-nerved with transverse veinlets, scaberulous on the outer surface, shortly pubescent toward the apex on the inner surface; *upper glume* 13–20 mm long, aristate, 7–9-nerved with transverse veinlets and pubescence similar to that of the lower glume, *anthecium* fusiform, acute, 6.8–8.5 mm long, 2.4–2.6 mm wide, pitted, with rounded excavations over the entire surface, glabrous; *lemma* 5-nerved. *Caryopsis* fusiform, brownish, 4.8–5.5 mm long, 1.8–2 mm wide; hilum linear, reaching the entire length of the caryopsis. *Male spikelets* lanceolate, acuminate, 4.3–5.7 mm long, 0.5–0.8 mm wide, 1/3–1/6 the length of the female spikelets, hispid to glabrous, whitish; *lemma* 3-nerved; *palea* 3.7–5.5 mm long, 2-nerved; anthers 1.8–2.5 mm long.

DISTRIBUTION.—Endemic to lowland forests in Bahia, Brazil (Figure 11).

ADDITIONAL SPECIMENS SEEN.—BRAZIL, BAHIA: Rodovía Camaçã-Canavieiras, 3 km E de Camaçã, *Belém and Aguiar 1389* (US); Lagoa Itaipé, at 1 km from the lake and 25 km SE of Uruçuca, *Calderón and Pinheiro 2172* (US, WIS); Fazenda João Elias, cacao plantation 3 km E of Camaçã on road to Canavieiras, *Soderstrom et al. 2123* (CEPEC, US); road from Una to Santa Luzia, 10 km SW of Una: Rio da Pimenta o Pimenteira, Fazenda S. Jorge, *Calderón and Pinheiro 2267* (CEPEC, US); 9 km from Una on the road to Santa Luzia do Salobro, *Soderstrom et al. 2229* (CEPEC, US); 6 km N of

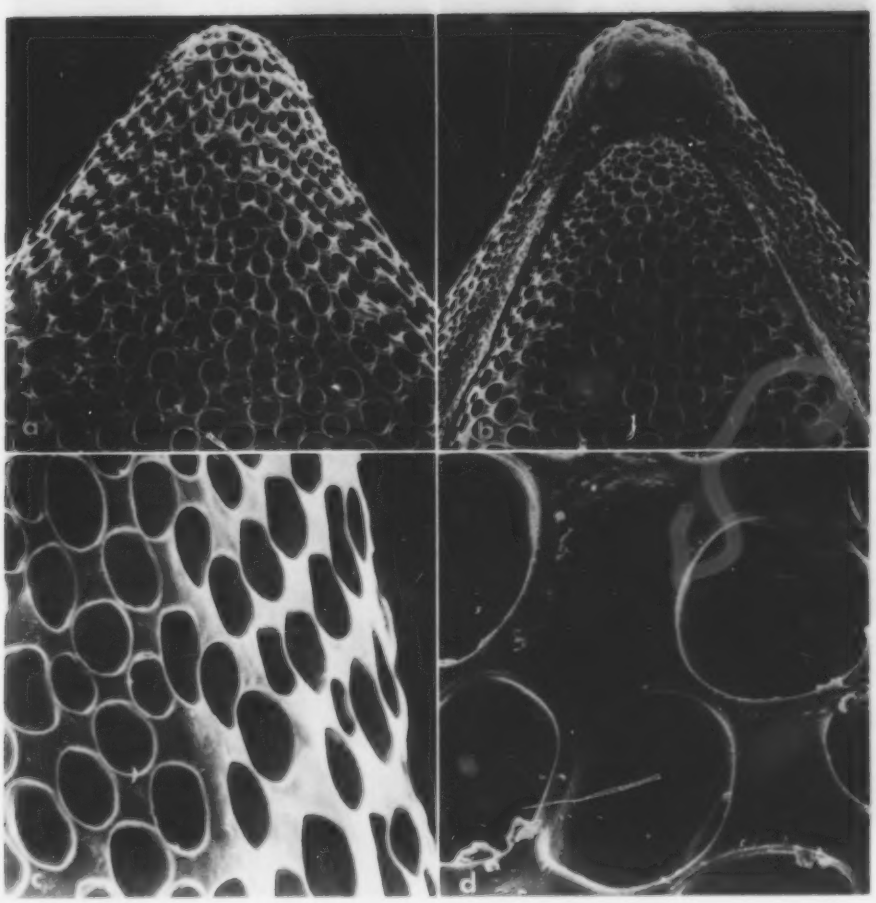

FIGURE 10.—Detail of female anthecium, *Olyra filiformis*: *a*, apex of the anthecium, dorsal side (× 100); *b*, apex of the anthecium, ventral side (× 100); *c*, detail of the lemma (× 260); *d*, detail of the excavations (× 700). All micrographs of *Soderstrom et al. 2123* (US). (Reduced to 77% of indicated magnifications for publication.)

Apuarema on road Apuarema-Jaguaquara, *Calderón et al. 2373* (US).

DISCUSSION.—This delicate species, growing among weedy vegetation in semi-shaded forests, is quite unlike any other in the genus. In some areas of Bahia the plants are abundant on sandy soil and have a weak, more or less cespitose base. They appear to be annuals (not known in the Bambusoideae); certainly none of the plants look older than a year. The species is easily distinguished by the linear inflorescences with appressed female spikelets that consist of very long and acuminate glumes that far exceed the anthecium in length. The female anthecia are very deeply and conspicuously pitted. Apparently, after final flowering the flowering node may produce a tuft of new branches causing the topheavy culm to bend over to the ground where it takes root to produce a new plant (*Soderstrom et al. 2123*). In flower between March and July.

8. *Olyra glaberrima* Raddi

FIGURES 4, 12, 30*e*,*f*

Olyra glaberrima Raddi, 1823:19. [Type: "Invenitur in Monte nuncupato Corcovado non procul ad Urbe Rio de Janeiro." Holotype, PI, not seen, fragment of the holotype, US sheet no. 2877950.]

Olyra semiovata Trinius, 1826:249. [Type: "V. sp. Brasil (*Langsdorff*)." Holotype, LE, not seen, fragment of the holotype, US sheet no. 2877927.]

Olyra obliqua Desvaux, 1831:210. [Type: "Habitat in Brasilio." Holotype, P, not seen, fragment of the holotype, US sheet no. 2877938.]

Olyra corcovadensis Wawra, 1866:180, pl. 95. [Type: "Corcovado an feuchten schattigen Orten; Wwr u. *Maly* coll. n. *504*," not seen, current location unknown.]

Olyra semiovata var. *pubiflora* Hackel, 1904:276. [Type: "In silvis in regione cursus superioris fluminis Apa, Dec. n. 8194 (*Hassler*, Paraguay)." Holotype, W, not seen, fragment of the holotype, US sheet no. 2877925; isotypes, MO, P.]

Olyra yucatana Chase, 1908:178. [Type: "*Gaumer 2372*, No. 125941 Herb. Field Columbian Museum." Holotype, F, not seen, fragment of the holotype, US sheet no. 2877920.]

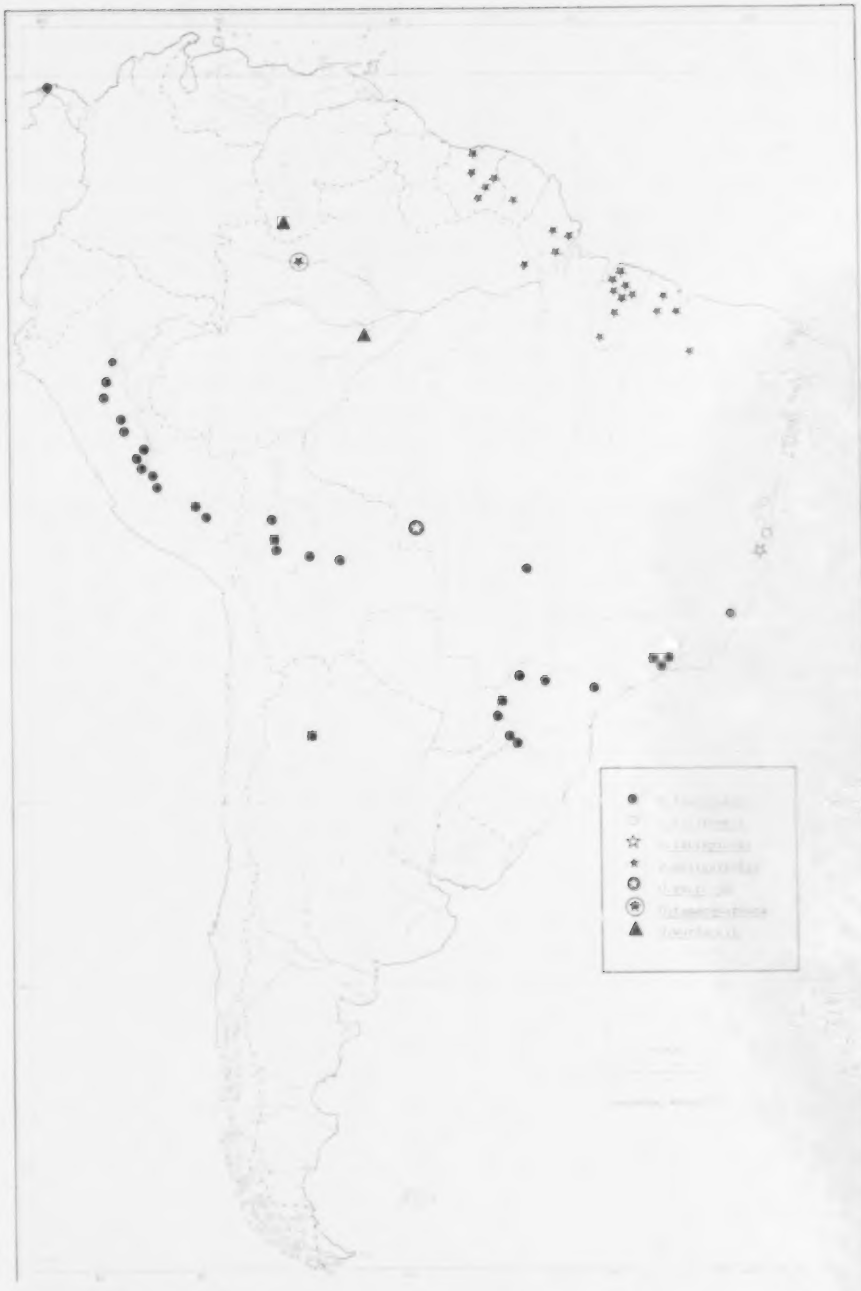

FIGURE 11.—Distribution of *Olyra fasciculata*, *O. filiformis*, *O. latispicula*, *O. obliquifolia*, *O. retrorsa*, *O. tamanquareana*, and *O. wurdackii*.

Olyra semiovata var. *pubescens* Hackel, 1910:46. [Type:"Paraguay septentr. a 1909 leg. *Fiebrig n. 5299* in Herb. Hassler." Holotype, W, not seen, fragment of the holotype, US sheet no. 2877926.]

Cespitose perennials, short-rhizomatous, with 10–20 culms in a fascicle. *Culms* 60–200 cm tall, erect, geniculate at the lower nodes, unbranched; internodes cylindrical, glabrous to shortly pubescent with retrorse hairs; nodes thickened, glabrous, purplish. *Leaves* with sheaths greenish to purplish, strongly ribbed, shortly hispid, the margins long-ciliate, more densely so toward the upper portion; auricles membranous;

ligule membranous-ciliate, small, 0.5–0.8 mm long; pseudopetiole 0.3–0.7 cm long, stramineous to purplish, densely pubescent with short, appressed whitish hairs on both surfaces; blades ovate-lanceolate, 17–27 cm long, 4–8.5 cm wide, ascending, asymmetric and truncate at the base, symmetric at the acuminate tip, glabrous, the margins scaberulous to shortly ciliate, the midnerve inconspicuous or prominent toward the base; *Inflorescences* paniculiform, borne from the uppermost nodes, long-exserted, the peduncles longitudinally ridged, glabrous; panicles lax, diffuse, pyramidal, 9–23 cm long, 5–18 cm wide, the branches spreading, the lower ones verticillate and with numerous male spikelets only or occasionally with a terminal female spikelet, the upper branches alternate, with male spikelets below and a single terminal female spikelet in each branch; axis and branches longitudinally ridged, scabrous, the axils of the branches glabrous; pedicels of the female spikelets thickened, sparsely scabrous; pedicels of the male spikelets scabrous. Axillary panicles similar to the terminal one. *Female spikelets* fusiform, aristate, 15–23 mm long, 2.5–3 mm wide, the glumes unequal and longer than the anthecium; *lower glume* long-aristate, scabrous on both surfaces or the inner surface glabrous, 5–9-nerved with transverse veinlets, the awn 5–11 mm long; *upper glume* acuminate to long-aristate, 10–14 mm long, scaberulous on both surfaces, 5–7-nerved; *anthecium* broadly ellipsoid, acute, 6.5–8.6 mm long, 2.2–3 mm wide, whitish to stramineous with black spots at maturity, smooth and shining, densely pubescent toward the lower margins of the lemma, with long, flat, whitish to brownish macrohairs, shortly pubescent toward the apex; *lemma* 5-nerved; *palea* 2-nerved, with sparse, flat hairs toward the apex to completely glabrous. *Caryopsis* ellipsoid, brownish, 4.5–5.4 mm long, 2.8 mm wide; hilum

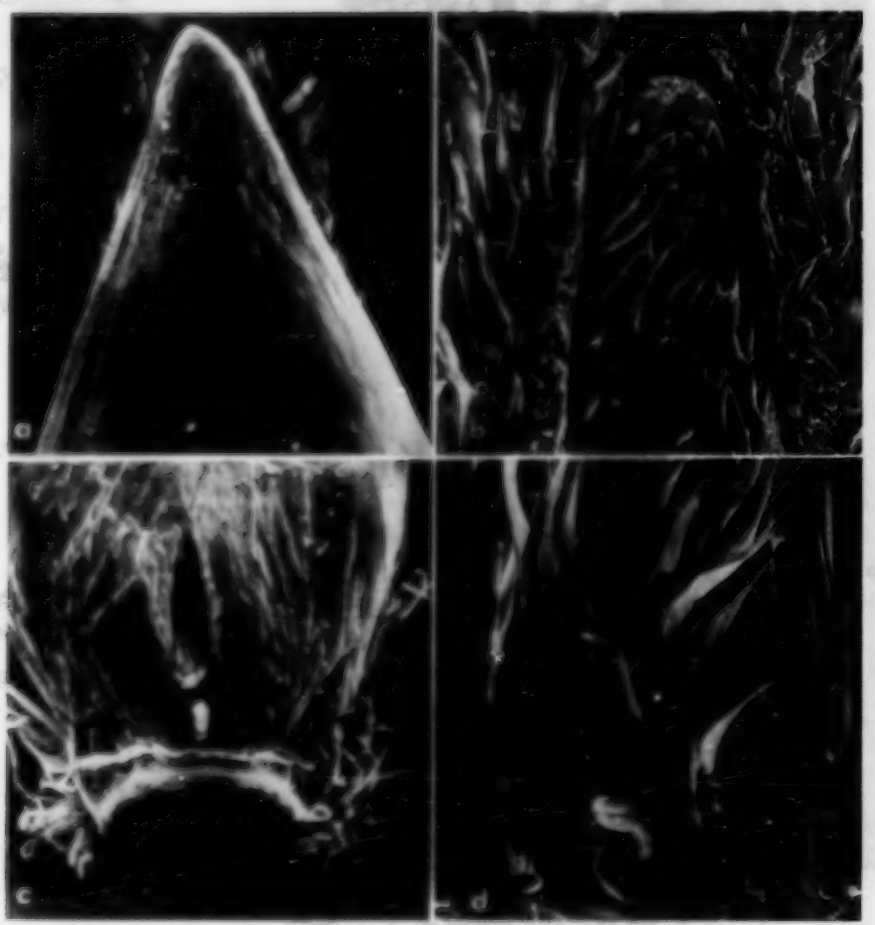

FIGURE 12.—Detail of female anthecium, *Olyra glaberrima*: *a*, apex of the anthecium, dorsal side (× 50); *b*, apex of the anthecium, ventral side showing flattened macrohairs (× 100); *c*, base of the anthecium showing the germination lid (× 40); *d*, detail of the hairs on the base of the lemma (× 100). All micrographs of *Chase 12171* (US). (Reduced to 71% of indicated magnifications for publication.)

as long as the caryopsis. *Male spikelets* fusiform, brownish to purplish, 7.3–12 mm long, 0.6–0.9 mm wide; *lemma* 3-nerved, aristate, the awn scabrous, ~1 mm long, the rest of the surface glabrous; *palea* 6–9 mm long, acuminate to short-aristate, 2-nerved, glabrous, purplish; anthers orange, 3–6 mm long.

DISTRIBUTION.—Disjunct between northern Mesoamerica (Mexico, Belize, Guatemala, and Honduras) and eastern Brazil (Figure 4), growing in moist forests from sea level to 700 m elevation; also two collections from southern Peru.

ADDITIONAL SPECIMENS SEEN.—BELIZE, BELIZE: Gracie Rock, 1.5 mi [2.5 km] S of mile 22 on Western Highway, *Croat 23894* (MO, US), *Liesner and Dwyer 1511* (US); Gracie Rock, Sibun river, *Gentle 1639* (US, WIS). COROZAL: San Antonio, *Gentle 4759* (NY, US, WIS). EL CAYO: El Cayo, River bluffs, *Bartlett 11475* (NY, US); 9.5 mi [15 km] S of Georgeville on road to Augustine, *Croat 23478* (US); Belize-Cayo road, high ridge, 41 mi [65 km] section, *Gentle 9681* (US); vicinity of Cuevas, S of Millionario, *Croat 23604* (MO); Valentin, *Lundell 6210* (NY, US); Rio Frio Cave, near Augustine, *Spellman 1586* (MO), *Swallen 1580* (MO). TOLEDO: In high ridge, near Condemn Branch Hills, *Gentle 5253* (US); Yellow flowers, in high ridge, near San Antonio, *Gentle 5503* (US). DISTRICT UNKNOWN: Tower Hill Estate, *Karling 56* (US); Roaring Creek, *Lundell 8729* (US).

BRAZIL, ESPÍRITO SANTO: Vargem Alta, Fruteira, *Pereira 2259* (RB, US); Reserva Florestal do Rio Doce, *Sucre 8476* (RB); without locality, *Kuhlmann 143* (US). GOIÁS: Without locality, *Gardner 3523* (US). PARANÁ: Road BR-2, Ribeirão do Cedro, *Hatschbach 8719* (US); Fazenda no Río Vermelho, 18 km ao noroeste de Bela Vista, *Tessmann 3842* (US); high bank of Rio Ligeiro, S of Rio Ivaí, ~15 km E of São Tomé, *Lindeman and Haas 914* (US); without locality, *Dusen 4416* (US). PERNAMBUCO: Tapera, *Pickel 2354* (WIS). RIO DE JANEIRO: Andaraí, *Freire 423* (US); Camino dos Macacos, *Chase 9971* (F, MO, NY, US); Corcovado, *Luetzelburg 109* (NY), *Chase 8183* (F, MO, NY, US), *8185* (F, MO, US), *9749* (F, US); Estrada Velha, Rio de Janeiro-Petrópolis, União Industria, *Soderstrom and Sucre 1867a* (CEPEC, US); Excelsior, *Brade s.n.*, Dec. 2, 1928 (R, US); Fabrica das Chitas, *Schwacke s.n.* (US); Floresta da Covança, Jacarepaguá, *Duarte 5043* (US); Gávea, Parque da Cidade, *Calderón 2010* (RB, US); Mata da Tijuca, *Kennedy and Sucre 872* (US); Morin, Petrópolis, *Chase 12171* (US); Petrópolis, *Gães 804* (R), *94* (R); Pico da Tijuca, *Chase 8487* (F, US); Bico do Papagaio, *Emygdio 379* (US), *Almeida and Laroche 1368* (RB), *Almeida 1537, 2069* (RB), *Lutz 1759* (R, US); Rio de Janeiro, Alto da Boa Vista, *Black 54-18122* (IAN); Serra do Corcovado, entre Vista Chinesa e Mesa do Emperador, *Calderón 2013* (US), Serra do Corcovado, Sumaré, *Calderón 2021* (US) Estrada da Vista Chinesa, *Sucre 2132* (US); Tijuca, *Chase 12146* (US), *Brade s.n.*, Dec. 2, 1928 (US), *Kennedy and Sucre 872* (US); Tijuca, Bom Retiro, *Rosa 80* (R); Tinguá, Boa Esperança, *Mello Filho 1125* (US); without locality, *Beetle 190* (US), *Glaziou 18640* (NY); without locality and collector, Jan. 21, 1886 (US 2463835). SANTA CATARINA: Brusque, Azambuja, *Calderón 2001* (US), *Reitz and Klein 870* (NY, US); Blumenau, *Ule 979* (US); Braço Joaquin, Luis Alves, Itajaí, *Klein 929* (US), *Reitz and Klein 3342* (F, US); Guaramirim, *Reitz and Klein 2395* (US); Ibirama, *Luederwald s.n.*, 1903 (US); Horto Florestal I.N.P., Ibirama, *Klein 949* (US), *Reitz and Klein 1169* (US), *Smith and Klein 7535* (US), *7537* (R, US); Isla de Santa Catarina, *Gaudichaud 94* (US); Jaragua, *Hoehne 24387* (US); Mato de Malucher, Brusque, *Smith 5782* (R, US); Morro do Bau, *Lourteig 2359* (US); Morro do Bau, Ilhota, *Reitz and Klein 18180* (US); Morro Costa da Lagoa, *Klein 7001* (US); Morro do Ribeirão, *Klein 6968, 6971* (US); Parque Estadual do Turvo, Tenente Portela, *Klein 11885* (US); Paulo Lopes, costa do Morro de Paulo Lopes, *Klein 9814* (US); Sabiá, Vidal Ramos, *Klein 2285* (NY), *Reitz and Klein 4285* (US); Três Barras, Garuva, S. Francisco do Sul, *Reitz and Klein 5560* (US). SÃO PAULO: Alto da Serra, *Usteri 9972* (US); Morro das Pedras, *Brade 7859* (R, US); Parque do Estado, *Hoehne 28592* (NY, US); Piassaguera, *Hoehne 7966* (US); Pindorama, Estacão Experimental, *Carvalho 165* (US); 10 km S of center of city of São Paulo, Instituto de Botânica, Parque do Estado, *Eiten 5592* (SP), *Sendulsky 276* (US); São Paulo, *Pickel 5880* (US); São Paulo, Serra da Cantareira, *Pickel 5894* (US), *Coelho s.n.*, May 10, 1947 (US); without locality, *Skvortzov 3* (US). STATE AND LOCALITY UNKNOWN: *Riedel 935* (US), *Burchell 3320* (US), *Glaziou 505* (US).

GUATEMALA, ALTA VERAPAZ: Montana Yxocubvain, 2½ mi [4 km] W of Cubilquitz, *Steyermark 44967* (F, US). PETÉN: El Paso, *Lundell 1574* (US); Hiltum, *Lundell 3586* (US); La Libertad, *Lundell 3375* (US, WIS); Tikal, *Cook and Martin 116* (US), in ramonal covering the ruins, *Lundell 15441, 15808* (US), ruina templo Las Inscripciones, *Molina 15774* (US); along road to Aguada Seco, *Lundell 15689* (US); between Main Plaza and Aguada Corriental, *Contreras 3841* (US); Lake Yaxha, *Gentry 8303* (MO); north shore of Lake Yaxha, *Croat 24671* (MO); 2 mi [3.2 km] S of entrance of Tikal National Park, *Croat 24712* (MO); NW of Jungle Inn, *Contreras 3901* (US); in ramonal on Remate Road, *Contreras 293* (US); vicinity of archeological camp on N shore of Lake Yaxha, *Croat 24671* (US); Uaxactum, *Bartlett 12167* (NY, US).

HONDURAS, CORTÉS: Calán, *Dickson 1405* (US).

MEXICO, CAMPECHE: Tuxpeña, *Lundell 1061* (F, US, WIS); 4 km S of Xpujil, *Sheperd 32* (WIS). CHIAPAS: Hacienda San Pablo, near Champotón, *Collins 58, 73* (US); Pixoyal, *Ross s.n.*, 18 May 1954 (US); 19 mi [30 km] E of Zapata on the Zapata-Balancán road, *Davidse 9425* (US); 17 km SE of Palenque, on the road to Bonampak, *Davidse et al. 20395* (MO). OAXACA: El Cerro de Nacimiento, E of Cosolapa, *Vera Santos 2437* (US). QUINTANA ROO: Coba, *Lundell 7694* (US); 9 km S of San José de la Montaña, *Davidse et al. 20268* (MO); 8 km N of Union, 110 km SW of Chetumal, *Davidse 20162* (MO); 15 km N of Dzuich, *Roe et al. 1340* (WIS); Tancah, *Swallen 2825* (US). SAN LUIS POTOSÍ: Tamazunchale, *Lundell*

and Lundell 7238 (NY, US). TABASCO: La Palma, Balancán, *Matuda 3244* (US); 5 km del rancho Punta de Montaña, *C.Cowan 3375* (MO). YUCATÁN: Chichen Itzá, *Bequaert 47* (US), *Steere 1511* (US), *Swallen 1580* (NY, WIS), *2443* (US); Lake Chichankanab, *Gaumer and Sons* 23683 (US), *Swallen 2758 1/2* (US); Peto, *Swallen 2720* (US).

PERU, MADRE DE DIOS: Province of Manú, road from Salvación to Shintuya, 600 m, *Plowman and Davis 5085* (US). PASCO: Province of Oxapampa, Iscocacin, Palcazú Valley, trail to Villa América, *Foster 9527* (MO).

DISCUSSION.—Mesoamerican plants have long been known as *Olyra yucatana*, but we can find no way to differentiate them from the Brazilian populations of *O. glaberrima*. *Olyra glaberrima* was formerly known only from Atlantic Brazil, from Espirito Santo to Santa Catarina. Conspecifity with *O. yucatana*, which occurs from southern Mexico to Hondurus, leaves open the question as to how such a disjunct distribution came about.

The *Plowman and Davis 5085* collection from Peru may possibly represent a new species. It differs from typical *O. glaberrima* in its more delicate habit with thinner leaves, papillose-pilose sheaths, sparsely pubescent pseudopetioles, awnless female glumes, and shorter (4 mm), awnless, male spikelets. However, female anthecia were not available and further study is required to determine whether this plant is indeed different from *O. glaberrima*. Flowering in Mesoamerica is from December to July, and in South America from October to April.

9. *Olyra holttumiana* Soderstrom & Zuloaga

FIGURE 4

Olyra holttumiana Soderstrom & Zuloaga, 1986:722. [Type: "Panama. Prov. Panamá, La Eneida, region of Cerro Jefe," 3 March 1973, *Dressler 4288*. Holotype, US, sheet no. 2685261; isotypes, K, LE, MO.]

Perennial. *Culms* arching, ~2 m long, branching from the upper nodes; internodes cylindrical, hollow, glabrous; nodes compressed, purplish, glabrous. *Leaves* with sheaths stramineous with short-ciliate borders, otherwise glabrous, with conspicuous membranous auricles, the neck purplish black, short-pubescent; ligule membranous, conspicuous, 7–8 mm long, purplish black, short-ciliate above, shining and glabrous on the inner surface, short-pubescent on the outer; pseudopetiole 0.4–0.7 cm long, purplish, short-pubescent on both surfaces; blades oblong-lanceolate, acuminate, 24–35 cm long, 6.8–9 cm wide, with an asymmetric base and apex, ascending, the upper surface greenish, the lower bluish green, both surfaces short-ciliate, the midnerve manifest on both surfaces, with scabrous borders. *Panicles* lax, 15–18 cm long, 20 cm wide, with the branches diverging from the axis, the lower ones verticillate, the upper alternate along the axis; axis longitudinally ridged, scabrous, the branches triquetrous, flattened, hispid and scabrous toward the upper part, the base of the branches densely hispid and purplish black, the male spikelets in pairs and short-pedicellate, appressed to the flattened side, the pedicels thin, hispid, the female spikelets terminal, single; pedicels of the female spikelets thickened, short-hirsute. Axillary panicles similar to the terminal. *Female spikelets* fusiform, aristate, 35–50 mm long, 5.5–6.2 mm wide, greenish, the glumes unequal and longer than the anthecium; *lower glume* aristate, 15-nerved, the nerves tessellate, the inner surface hispid toward the apex, the outer surface scaberulous, the awn markedly hirsute; *upper glume* 11-nerved, the nerves tessellate with a pubescence similar to that of the lower glume; *anthecium* long-ellipsoid, acute, 14.5–15.8 mm long, 5.6–6 mm wide, glabrous, smooth, shining, white; *lemma* 11-nerved; *gynecium* with a single style and 2 plumose stigmas; lodicules 3, ~1.8 mm long. *Male spikelets* lanceolate, 10.2–10.9 mm long, 0.8–1.2 mm wide, purplish, scabrous; *lemma* acuminate, 7–9-nerved, scabrous on the outer surface; *palea* 8.2–9.7 mm long, 4-nerved, glabrous, purplish; stamens 3.

DISTRIBUTION.—Known only from Panama (Figure 4).

ADDITIONAL SPECIMEN SEEN.—PANAMA, PANAMÁ: Cerro Jefe, *Nee 13970* (WIS).

DISCUSSION.—*Olyra holttumiana* is distinguished by its very large female spikelets with long-awned, many-nerved glumes and male spikelets with an unusually large number of nerves in the lemma and palea. Although somewhat resembling *O. fasciculata* and *O. obliquifolia*, the habit and smooth female anthecium of this species suggest that it is more closely related to *O. latifolia*, *O. caudata*, and *O. buchtienii*.

10. *Olyra humilis* Nees von Esenbeck

FIGURES 13, 15

Olyra humilis Nees von Esenbeck, 1829:304. [Type: "Habitat ad ripas Taquari fluminis (*Sellow*. Vidi in Herb. Reg. Berol.)." Holotype, B, fragment of the holotype, US sheet no. 2877946.]

Olyra humilis var. *angustifolia* Doell in Martius, 1877:321. [Type: "A cl. *Riedel* (n. *1938*) in umbrosis siccis prope S. Carlos prov. S.Pauli lecta." Holotype, not seen, current location unknown; isotype, US sheet no. 2877947.]

Olyra humilis var. *latifolia* Doell in Martius, 1877:321. [Type: Based on *Olyra humilis* Nees von Esenbeck, 1839:304.]

Olyra glaberrima var. *humilis* (Nees von Esenbeck) Mez, 1912:28. [Type: Based on *Olyra humilis* Nees von Esenbeck, 1839:304.]

Short- to long-rhizomatous perennial grass in cespitose clumps, with 10–20 culms in a fascicle. *Culms* geniculate-ascending or erect, many-noded, 25–100 cm tall; internodes short-hispid with whitish hairs to glabrous, hollow, cylindrical, the basal ones with a sheath only; nodes thickened, dark, glabrous. *Leaves* with sheaths pale with greenish spots, ribbed, glabrous or with papillose-pilose hairs, the margins ciliate; auricles absent; ligule membranous, short-ciliate at the tip, small, 0.4 mm long; pseudopetiole 0.2 cm long, stramineous to brownish, densely hispid, with long and whitish hairs; blades ovate-lanceolate to lanceolate, 4.3–11.5 cm long, 1–2.2 cm wide, asymmetric and truncate at the base, symmetric at the

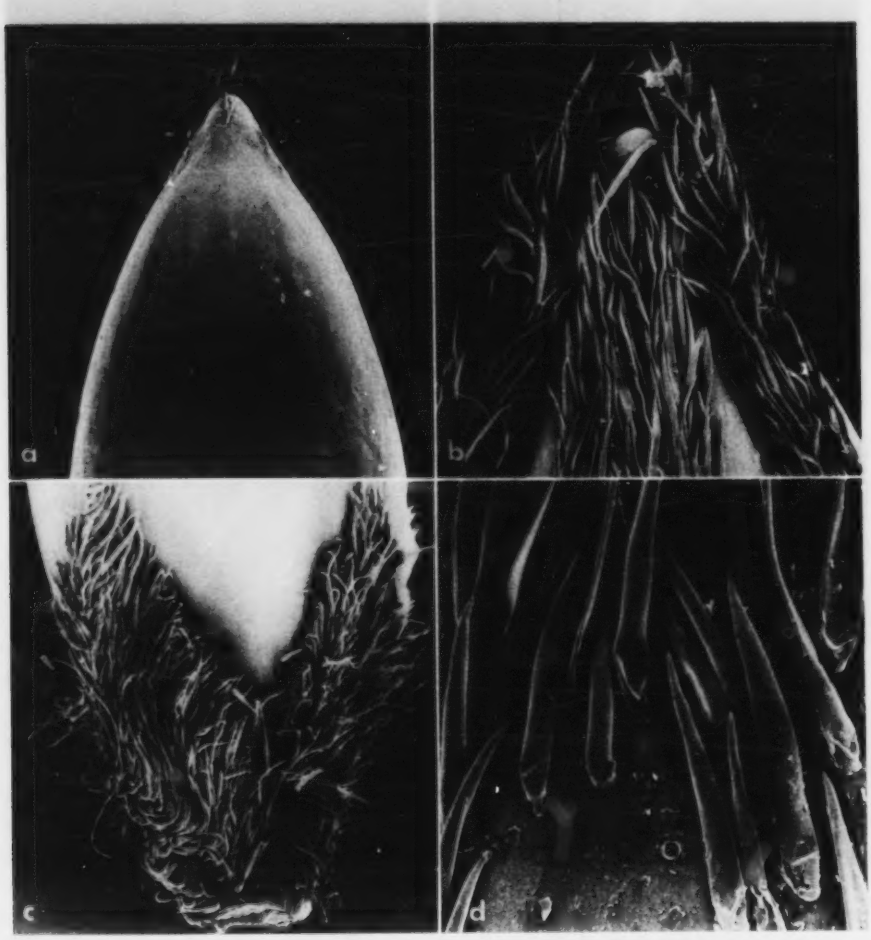

FIGURE 13.—Detail of female anthecium, *Olyra humilis*: *a*, anthecium, dorsal side (× 30); *b*, apex of the anthecium, ventral side (× 50); *c*, base of the anthecium, ventral side (× 30); *d*, portion of the palea showing flattened macrohairs (× 200). All micrographs of *Valls et al. 1804* (US). (Reduced to 77% of indicated magnifications for publication.)

tip, scabrous on the adaxial surface to completely glabrous, the abaxial surface glaucous, the margins scabrous, the midnerve inconspicuous. *Inflorescences* borne from the uppermost nodes, with 1–6 panicles at each node, the panicles lax, pyramidal, 4–9 cm long, 1–5.5 cm wide, few-flowered, the branches spreading, the lower ones whorled to alternate, the upper ones alternate, each branch with numerous male spikelets in pairs (one short- and the other long-pedicellate) below and one single terminal female spikelet; *axis* longitudinally ridged, scabrous, the branches triquetrous, scabrous; pedicels of the female spikelets thickened, smooth, glabrous. Axillary panicles similar to the terminal one. *Female spikelets* fusiform, aristate, 14–21 mm long, 2.3–2.8 mm wide, both glumes shortly pilose to scabrous on the inner surface, and glabrous to scaberulous on the outer one; *lower glume* aristate, 5–7-nerved with transverse veinlets, the awn geniculate and variable in length, 4–10 mm long; *upper glume* acuminate to shortly aristate, 11–11.5 mm long, 5–7-nerved with transverse veinlets; *anthecium* long-ellipsoid, acute apically, 6–9.8 mm long, 2.3–2.7 mm wide, whitish, smooth and shining, pilose; *lemma* 5-nerved, pilose toward the apex and base on the ventral surface, the base covered by long, whitish or brownish, flattened unicellular macrohairs, the apex with flattened, unicellular macrohairs and prickle hairs, the dorsal surface of the lemma with sparse hairs toward the apex and base to glabrous; *palea* 2-nerved, with flat hairs toward the apex, otherwise glabrous. *Caryopsis* ellipsoid, brownish, 5 mm long, 2.8 mm wide; hilum reaching the entire length of the caryopsis. *Male spikelets* fusiform, aristate, 8.5–11 mm long, 0.6–0.8 mm wide, purplish, glabrous; *lemma* 3-nerved, aristate, the

awn scabrous, 2–2.5 mm long, the rest of the surface glabrous; *palea* 5.5–7.8 mm long, 2-nerved; anthers 3, 3.6–5.2 mm long.

DISTRIBUTION.—Northwestern Argentina, Brazil, and Paraguay (Figure 15); from sea level to 1250 m elevation.

ADDITIONAL SPECIMENS SEEN.—ARGENTINA, CORRIENTES: Arroyo Chimiray y ruta 40, *Quarín 3413* (US); 5 km E of Gdor. Virasoro, *Schinini and Carnevali 10490* (US). MISIONES: Concepción, *Parodi 6944* (US); San Javier, *Quarín 3456* (US); Santa Ana, *Montes 1181* (MO, US); Sierra Imán, *Bertoni 1964* (US); 5 km ruta 101 desde Deseado al SW, *Hunziker et al. 11028* (SI, US).

BRAZIL, DISTRITO FEDERAL: Acampamento do D.V.O., Brasília, *Belém and Mendes 60* (US); Fazenda Vargem Bonita, ~10 km S of Brasília, *Irwin et al. 12287* (F, RB, US); Parque Nacional do Gama, *Clayton 4959* (US); Parque Municipal do Gama, 25 km W of Brasília, *Irwin et al. 19480* (F, US); 3 km N of Sobradinho, *Irwin et al. 10096* (MO, US); tributary of Rio Sobradinho, *Clayton 4871* (US). GOIÁS: Serra dos Pirenéus, 20 km E of Pirenópolis, *Irwin et al. 34307* (MO). MINAS GERAES: Barreiros, *Kuhlmann s.n.*, Feb 20, 1926 (RB, US); Caxambu, *Sampaio 5946* (IAN, R); Chapeo de Sol, Serra do Cipó, *Chase 9198* (F, US); Morro do Pilar, *Black and Magâlhaes 51-12125* (IAN, US); Sabará, *Hoehne 6680* (IAN, R); Serra do Cipó, entre os km 130 e 132, *Black et al. 51-11989* (IAN); Serra do Cipo, km 103, *Chase 9286* (F, MO, US); Serra do Curral, *Chase 8934* (F, MO, NY, US), *8965* (IAN, RB, US). PARANÁ: Florestal, 29 km E de Curitiba, estrada Curitiba-Paranagua, *Tessmann 2786* (US); Papão Grande, *Dusen 7752* (US); Ponta Grossa, *Swallen 8455* (US); São João do Triunfo, *Hatschbach 14863* (US); Vila Velha, *Hatschbach 14666* (US). RIO GRANDE DO SUL: Chicuta Oliveira, Pelotas, *Klein et al. 916* (US); Colônia São Pedro, ~8 km from the ocean, *Soderstrom et al. 1991* (RB, US); Colônia São Pedro, estrada BR-101 a Colônia São Pedro, *Valls et al. 1828* (US); Fazenda da Palma, *Swallen 7016* (US); Fazenda Leitão, Rio Pardo, *Jurgens G122* (US); Hamburger Berg, *Lindman A485* (US), *Malme 190* (US); Morro da Policia, near Pôrto Alegre, *Rambo 3786-1* (US); Morro do Sabiá, near Pôrto Alegre, *Rambo 43745* (US, WIS); Pôrto Alegre, *Canisio 840* (US); Pareci Velho, prope Cai, *Rambo 43790* (US); Rodovía Santa Rosa-Girua, 13 km apos S. Rosa, *Valls et al. 1804* (US); Santa Barbara do Sul, estrada Carazinha-Cruz Alta, apos S. Marinho, *Valls et al. 1676* (US); São Leopoldo, *Dutra 551* (R), *Leite 2081* (GH); Três Cachoeiras, 6 km from ocean, *Soderstrom et al. 1988* (CEPEC, US); Panambi, rodovía BR-285, km 300, *Quarín 1163* (RB). SANTA CATARINA: Forest Seminário Diocesiano, W of Chapecó, *Smith and Reitz 12521* (US); W of Chapecó, on road to Guatambú, *Smith and Reitz 12529* (F, MO, R, US); Pinheiral, Faxinal dos Guedes, *Smith and Reitz 9777* (US); Linha Coqueiro, by Rio Peperi-Guaçú, *Smith and Reitz 12662* (US); Passo d'Anta, S of Abelardo Luz, *Smith and Reitz 12892* (R, US); Peperi, forest above Rio Peperi-Guaçú, *Smith and Reitz 12782* (R, US); Pinheiras by new airport E of Pôrto União, *Smith and Reitz 8848* (R, US); Ribeirão, Morro da Tapera, Ilha de S. Catarina, *Klein and Bresolin 8766* (US); Salete, *Klein and Bresolin 11580* (US); Vargem Grande, Lauro Muller, *Reitz and Klein 7233* (US); Vila Rica, by Rio do Peixe, *Smith and Reitz 12930* (R, US).

PARAGUAY: In regione fluminis Alto Paraná, *Fiebrig 5436* (US); in altaplanicie Sierra de Amambay, *Hassler 12051* (US).

DISCUSSION.—This species resembles *O. glaberrima*, from which it differs by the size of plants, inflorescences, and panicles. The common name in Brazil is "bambu-fraço." It flowers between October and May.

11. *Olyra juruana* Mez

FIGURES 14, 15, 17*e*

Olyra juruana Mez, 1917:45. [Type: "Brasilia: Dept. Amazonas ad flumen Jurua prope Minas Geraes (*Ule* n. 5469)." Holotype, B, not seen, fragment of the holotype, US sheet no. 2877945.]

Perennial, short-rhizomatous in cespitose clumps with 5–10 culms. *Culms* simple, 35–110 cm tall, geniculate-ascending; internodes compressed, hollow, glabrous, the lower internodes with a sheath only; nodes compressed, dark brown and shortly hirsute. *Leaves* 5–7 per complement; sheaths strongly ribbed, hispid over the entire surface to ciliate toward the margins, with or without long hairs toward the upper portion; ligule membranous, 0.4–0.7 mm long, shortly ciliate at the apex, brownish; pseudopetiole 0.3–0.5 cm long, ~0.2 cm wide, densely to sparsely pubescent with short, appressed hairs, brownish to purplish; blades ovate-lanceolate, 14–20 cm long, 4.5–5.9 cm wide, narrowing from an asymmetric and truncate base to a symmetric or asymmetric, apiculate apex, glabrous, occasionally hispid toward the base on the adaxial surface, the midnerve prominent toward the base, the margins ciliate or not. *Inflorescences* paniculiform, 1–4 borne from the uppermost nodes or usually a single terminal panicle present, the peduncles hirsute; panicles pyramidal, 6–14 cm long, 1–4 cm wide, the branches alternate, with numerous male spikelets short-pedicelled on tertiary branchlets, 5 to numerous terminal female spikelets present on each panicle; *axis* and branches densely hispid to scabrous, longitudinally ridged; pedicels of the female spikelets thickened, smooth. *Female spikelets* fusiform, 13.5–18.5 mm long, 2.5–3.5 mm wide, whitish to stramineous, with the lower and upper glume subequal, subulate apically, scabrous toward the apex, otherwise glabrous; *lower glume* as long as the spikelet, 7–11-nerved with transverse veinlets; *upper glume* 12–16 mm long, 7–11-nerved with transverse veinlets; *anthecium* fusiform, 8.8–10.7 mm long, 2.2–3.2 mm wide, whitish, acuminate apically, pilose all over the surface with long, appressed, cylindrical macrohairs; *lemma* 5-nerved, rugose at the upper margins; *palea* 2-nerved, excavated at the apex. *Caryopsis* long-ellipsoid, 6–6.5 mm long, 2 mm wide, brownish. *Male spikelets* fusiform, 4.2–6.7 mm long, 0.6–0.8 mm wide,

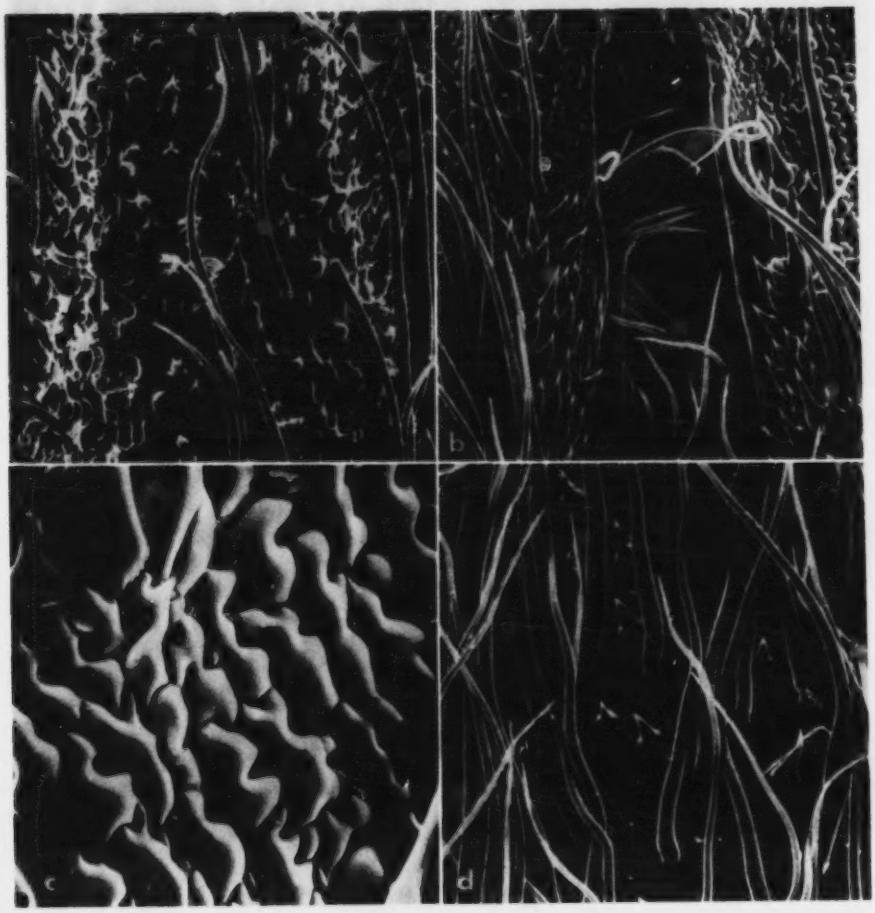

FIGURE 14.—Detail of female anthecium, *Olyra juruana*: *a*, apex of the lemma showing prickle hairs, long macrohairs, and excavations (× 200); *b*, anthecium, ventral side (× 200); *c*, upper portion of the lemma with rugose surface (× 1000); *d*, detail of macrohairs and prickle hairs (× 400). Micrograph *a* of *Vargas 15246* (US), *b–d*, of *Schunke 19* (US). (Reduced to 77% of indicated magnifications for publication.)

whitish to stramineous, hispid, occasionally glabrous; *lemma* 3-nerved, subulate apically; *palea* 2-nerved.

DISTRIBUTION.—Growing in forests of eastern Peru and western Brazil (Acre); occasional as far east as Pará (Figure 15); found at 120–800 m elevation.

ADDITIONAL SPECIMENS SEEN.—BRAZIL, ACRE: 52 km from Rio Branco on road to Sena Madureira, *Calderón and Soderstrom 2290* (US); 8°54'S, 72°51'W, *Calderón and Soderstrom 2352* (US); Porangaba, Rio Juruá-Mirim, *Maas et al. P12957* (US). PARÁ: Aguas Boas, Rio Pixuna, *Kuhlmann 1958* (RB, US).

PERU, CUZCO: Entre Pilcopata y Keres, *Vargas 15246, 16353* (US). LORETO: Prov. Maynas, Explorama Tourist Camp, Río Amazonas above mouth of Río Napo, *Gentry et al. 27478* (MO, US), *28975* (MO, US), *37167* (US, MO); Gamitanacocha, Río Mazán, *Schunke 19* (F, NY, US). PASCO: Prov. Oxapampa, Iscozacin, Palcazú Valley, *Foster 7968* (MO).

DISCUSSION.—Flowers between January and July. The Gentry et al. collections from northern Peru differ from typical material of *O. juruana* in having pseudopetioles densely pubescent over the entire surface; (1–) 4–7 panicles borne on the uppermost nodes, these small (2–3 cm long) and short-exserted; female spikelets sparsely hispid on the outer surface; and male spikelets only 4.2 mm long. More collections are needed to determine if these plants represent a new species.

12. *Olyra latifolia* Linnaeus

FIGURES 8*d–f*, 16

Olyra latifolia Linnaeus, 1759:1261. [Type: "Jamaica," not seen, current location unknown.]

Olyra paniculata Swartz, 1788:21. [Type: "Incolit Jamaicae." Holotype, S, not seen, current location unknown.]

FIGURE 15.—Distribution of *Olyra amapana*, *O. ciliatifolia*, *O. humilis*, *O. juruana*, *O. loretensis*, and *O. maranonensis*.

Olyra arundinacea Humboldt, Bonpland & Kunth, 1816:197. [Type: "Crescit in crepidinibus opacatis Andium Quinduensium prope El Azufral." Holotype, P.]

Olyra cordifolia Humboldt, Bonpland & Kunth, 1816:198. [Type: "Crescit in convalle frigida Bogotensi inter Santa Fe et Zipaquira." Holotype, P, not seen.]

Olyra pubescens Raddi, 1823:18. [Type: "In montibus ubique in Provincia Rio-Janeiro." Holotype, PI, not seen, fragment of the type, US sheet no. 2877930.]

Olyra brevifolia Schumacher, 1827:176. [Type: "Guinea, Africa." Holotype, not seen, current location unknown; fragment of the holotype, US sheet no. 2877961.]

Olyra scabra Nees von Esenbeck, 1829:306. [Type: "ad Almadem prov. Bahiensis (*Martius*)." Holotype, M, not seen, fragment of the holotype, US sheet no. 2877928.]

Olyra brasiliensis Desvaux, 1831:210. [Type: "Ex Brasili." Holotype, P, not seen.]

Olyra media Desvaux, 1831:106. [Type: "Crescit in Brasilio." Type, P, not seen.]

Olyra latifolia var. *arundinacea* Grisebach, 1864:535. [Type: Based on *O. arundinacea* Humboldt, Bonpland, and Kunth, 1816:197.]

Olyra latifolia var. *glabriuscula* Doell in Martius, 1877:316. [Type: Based on *O. arundinacea* Humboldt, Bonpland, and Kunth, 1816:197.]

Olyra latifolia var. *pubescens* Doell in Martius, 1877:316. [Type: Based on *O. pubescens* Raddi, 1823:18.]

Olyra cordifolia var. *scabriuscula* Doell, in Martius, 1877:317. [Type: "A beato Martio in silvis provinciae Minarum lecta." Holotype, M, not seen, fragment of the holotype, US sheet no. 2877954.]

Olyra latifolia var. *vestita* Henrard in Amshoff and Henrard, 1948:321. [Type: "Suriname R., Berg en Dal (*Focke n. 358*)." Holotype, U.]

Cespitose perennials, with the plants forming clumps of up to 20 culms from a hard, knotty crown. *Culms* 1–6 m tall, erect, climbing and leaning in shrubs, or decumbent, branching usually from the middle and upper nodes; internodes hollow, cylindrical, up to 1 cm in diameter, glabrous to shortly pilose, with or without retrorse hairs just above the nodes; nodes constricted, dark, shortly pilose with retrorse, appressed hairs, to glabrous. *Leaves* with sheaths covered by papillose-pilose hairs to glabrous, the margins short- to long-ciliate, the lower ones deciduous, the upper ones usually persistent; auricles present, membranous; ligules membranous, shortly pilose at the apex, 0.7–5 mm long, glabrous on the adaxial surface, shortly pilose on the abaxial; pseudopetiole dark brown, 0.4–0.7 cm long, shortly pilose; blades lanceolate, 13–30 cm long, 2–10 cm wide, asymmetric and narrowed to subcordate at the base, symmetric to slightly asymmetric and acuminate apically, densely hispid over the entire surface to glabrous, the basal margins short-ciliate to glabrous, the midnerve prominent, hirsute or not toward the base, the lateral nerves anastomosing. *Inflorescences* lax and diffuse, pyramidal, 12.5–21 cm long, 4–14 cm wide, with a ridged, hispid to glabrous peduncle, the branches divergent from the axis, the lower ones verticillate and only with male spikelets, the upper ones alternate and with male spikelets below and 1 to many terminal female spikelets; pedicels of the male spikelets thin, scabrous to densely hispid, those of the female spikelets thickened, purplish, short-pilose; *axis* longitudinally ridged, scabrous to densely hirsute, the branches triquetrous, hirsute to scabrous, the axils of the branches densely pilose. *Female spikelets* broadly lanceolate, aristate, 14–25 mm long, 2.8–3.1 mm wide, the glumes unequal, pubescent on the inner surface, the outer surface short-pilose, with the margins hirsute, to scabrous or glabrous; *lower glume* long-aristate, 5–11-nerved, with transverse veinlets; *upper glume* 9.4–12 mm long, short-aristate, 5–9-nerved, with transverse veinlets; *anthecium* ovate, obtuse to acute apically, 5.6–6.1 mm long, 2.6–3.1 mm wide, whitish, olivaceous at maturity, smooth and shiny, with rounded excavations toward the upper margins of the palea and lower margins of the lemma; lemma with short prickle hairs on the lower margins. *Caryopsis* ellipsoid, 4–4.5 mm long, 2.3–2.5 mm wide; hilum as long as the caryopsis; embryo 1/6 the length of the caryopsis. *Male spikelets* fusiform, aristate, greenish to purplish, 5.5–8.1 mm long, 0.7–0.9 mm wide; *lemma* aristate, 3-nerved, with strong nerves, glabrous on the inner surface, scabrous on the outer; *palea* 4.4–6.4 mm long, glabrous, purplish, 2-nerved.

DISTRIBUTION.—This is the most widespread and weedy of any species in the genus, and is found essentially throughout the Neotropics from Florida (not verified in recent times), the West Indies, and central Mexico (Nayarit and Tamaulipas) south to northern Argentina (Corrientes and Misiones). *Olyra latifolia* is found in forest margins, mostly below 1000 m elevation. The species has also become naturalized in Africa, including Madagascar.

ADDITIONAL NEW WORLD SPECIMENS SEEN.— ARGENTINA, CORRIENTES: Desembocadura del arroyo Garapé en el Río Parané, 45 km E de Ituzaingó, *Quarín et al. 2852* (US). MISIONES: Loreto, *Mutinelli s.n.*, Jan 1940 (US).

BELIZE, EL CAYO: Over Cohune River, *Bartlett 11566* (US); Cohune Ridge,*Lundell 6428* (NY, US); Hummingbird Highway, S of Belmopan, *Gentry 8585* (US); Mountain Pine Ridge, San Agustin, *Lundell 6755* (NY); Pine Ridge, Duck Run, *Bartlett 11538* (US); Reed Broken Ridge, *Gentle 9661* (US). STANN CREEK: Little Cocquericot, Belize River, *Lundell 3874* (US); Maskall, Northern River, *Gentle 1020* (NY, US, WIS); Maya Mounds, vicinity of Cockscomb Mountains, *Shipp 531* (NY); Stann Creek Valley, Big Eddy Ridge, *Gentle 3406* (NY, US); Temash River, *Schipp 1374* (NY). TOLEDO: Between Machaca and Camp 2, *Gentle 6930* (US); between Orange Point and Moho River, *Gentle 7683* (US); Edwards Road beyond Columbia, *Gentle 7370* (US); Swasey Branch, Monkey River, *Gentle 3983* (NY, US).

BOLIVIA, BENI: Guayamerín, *Krapovickas and Schinini 35105* (US). LA PAZ: Charopampa, *Buchtien 1155* (US); Mapiri, *Rusby 209* (US); San Carlos, *Buchtien 7* (US). PANDO: SW of Cobija on Río Naraneda, *Sperling and King 6446* (US). SANTA CRUZ: Ichilo, Montero to Puerto Grether, *Renvoize and Cope 3948* (MO).

BRAZIL, AMAPÁ: Around Pôrto Platon, *Pires et al. 51024* (US); Rio Amapari, frequent along road to Pôrto Terezinha, *Cowan 38486* (RB). AMAZONAS: Santa Isabel, Rio Negro, *Baldwin Jr. 3401* (US); Suomata, Tabatinga, *Pires and Black 837* (US). BAHIA: Área do CEPEC, *Hage 210* (CEPEC, US), *Santos 3421* (RB); vicinity of Salvador, *Chase 7862* (US); Brotas, *Chase 7878* (US); ramal que liga a rodovía Ilhéus-Itabuna ao povoado de Japú, km 1, *Santos and Mattos Silva 3223* (CEPEC); rodovía Olivença-Maruim, 12 km S de Olivença, margem do Rio Acuipe, *Mattos Silva et al. 1503* (CEPEC). CEARÁ: Serra do Baturité, *Eugenio 281* (RB). ESPÍRITO SANTO: Morro Bom Retiro, *Soderstrom and Sucre 1958* (US); Reserva Florestal de Linhares, *Soderstrom and Sucre 1885* (US); Jaticoba, *Brade 18499* (RB). GOIÁS: Estrada

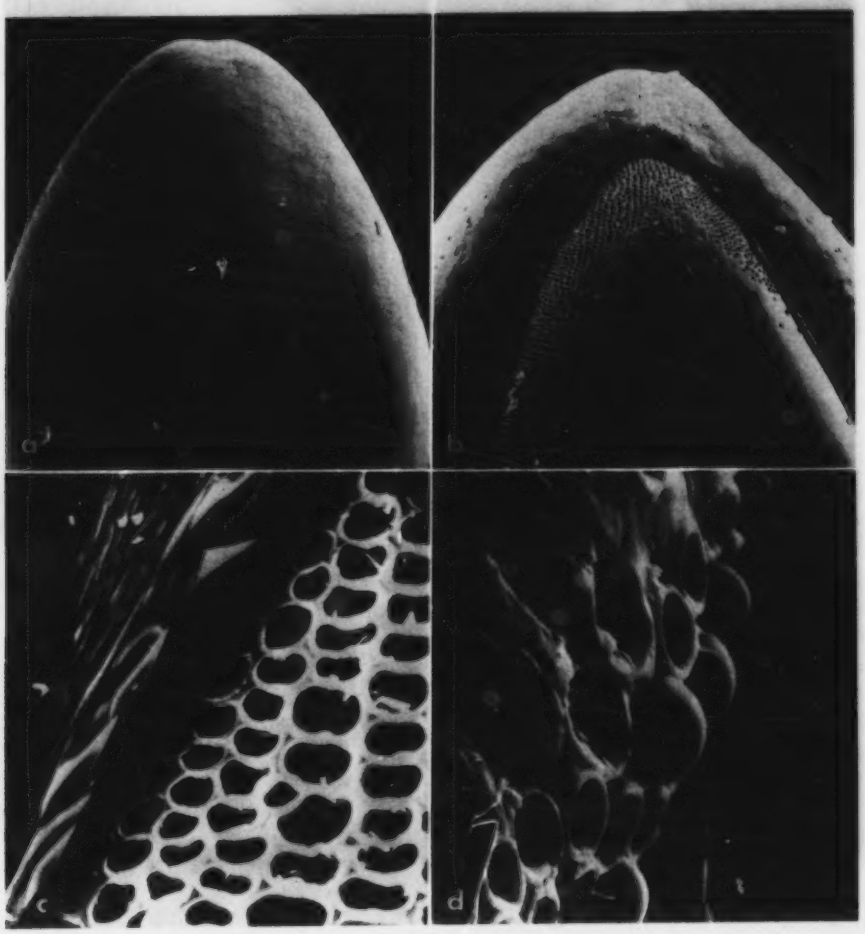

FIGURE 16.—Detail of female anthecium, *Olyra latifolia*: *a*, anthecium, dorsal side (× 30); *b*, anthecium, ventral side showing excavations on apex of palea (× 50); *c*, detail of prickle hairs on margin of the lemma and rounded excavations on the tip of the palea (× 500); *d*, base of the anthecium showing rounded papillae and excavations (× 1000). Micrograph *a* of *Reeder & Reeder 2422* (US), *b-d* of *Schunke 1930* (US). (Reduced to 77% of indicated magnifications for publication.)

Leonino-Mozarlândia, prox. a Leonino, *Guimarães 89* (US); between Annápolis and Goyaz, *Chase 11497* (US). MARANHÃO: Carolina to San Antonio de Balsas, *Swallen 4041* (RB, US). MATO GROSSO: Entre 17 de Febrero e Mingão, *Kuhlmann 2676* (RB); 20 km S of Xavantina, *Irwin et al. 17038* (RB); km 274 of Xavantina-Cachimbo road, *Philcox et al. 3115* (RB); km 264 of Xavantina-Cachimbo road, *Philcox and Fereira 4234* (RB); 30 km ENE of Barra do Garças, *Anderson 9778* (RB); Bandalta, *Pereira et al. 467* (RB). MINAS GERAIS: Fazenda da Cachoeira, Municipio Tombos, *Barreto 1646* (US); Fazenda da Tabunha, Dist. Ilhéu, *Mexia 4963* (WIS); without locality, *Widgren 914* (US). PARÁ: Belém, *Archer 7977, 8200* (US), *Black 54-16154* (US), *Pires and Black 164* (RB, US); margem esquerda do Rio São Manoel, abaixo Cachoeira do Caldeirão, *Pires 3855* (US); Castanhal, woods along Braganza railway, *Goeldi 302* (US); colônia 3 de Outubro, *Guedes 282* (US). PARANÁ: Hôrto Florestal near Maringa, *Lindeman and Haas 13233* (US); Morretes, *Dombrowski 7269* (US); Parque Nacional Iguassú, *Duarte 1878* (RB). PARAÍBA: Preia (Escola), *Vasconcellos 5859* (US). PERNAMBUCO: Tapera, *Pickel 1642* (WIS); Bonito, *Tenorio 67-247* (US). RIO DE JANEIRO: Cosme Velho toward Corcovado, *Soderstrom et al. 1857* (CEPEC, US); Alto da Boa Vista, *Sucre 2112* (RB); Jardim Botânico, *Sucre 2062, 2126* (RB, US); Campo Grande, Serra do Mendanha, *Lima 67* (RB), *Sucre et al. 6388* (US); Floresta da Covanca, Jacarepaguá, *Duarte 5042* (RB); Itaipuaçú, Pico Alto Moirão, *Andreata 163* (RB); Sumaré, *Sucre 6234* (RB). RIO GRANDE DO SUL: Tôrres, Três Cachoeiras, *Mattos 20* (US);

Steinkopf, pres São Leopoldo, *Rambo 42283* (WIS). RONDÔNIA: Rio January, *Kuhlmann 1865* (RB); km 214-215 Madeira-Mamoré railroad near Abunã, *Prance et al. 5973* (US); vicinity of Santa Barbara, 15 km E of km 117, *Prance and Ramos 7170* (US); 1 km N of Ribeirão, road Abunã to Guajará-Mirim, *Prance et al. 6450* (US); track between Mutumparana and Rio Madeira, *Prance et al. 5491* (US). RORAIMA: Fernando Costa, *Black 51-13719* (US); Canto Galo, Rio Mucajaí, *Prance et al. 3960* (US). SANTA CATARINA: S. Ludjero, *Orth 3100* (US). SÃO PAULO: Loreto, *Sampaio 15948* (US); vicinity of São Vicente, *Smith 2082* (US).

COLOMBIA, ATLÁNTICO: Los Rendales, near laguna de Sábalo, *Dugand and Jaramillo 2714* (US). ANTIOQUIA: Vicinity of Planta Providencia, valley Río Anori between Dos Bocas and Anori, *Denslow 2296* (MO). BOLÍVAR: Island of Mompos, Lands of Loba, *Curran 370* (US). CALDAS: Santa Cecilia, *van Sneidern 5247* (US). CAQUETÁ: Río Orteguaza, *Woronow and Juzepczuk 6136* (US). CHOCÓ: Bahia Solano, near Ciudad Mutis, *Killip and Garcia 33597* (US); Río San Juan, *Cuatrecasas 21382* (US). GUAJIRA: S of Carraipia, *Haught 4276* (US). MAGDALENA: Río Frio to San Andres de la Luna, *Pittier 1700* (US); Sierra de Perijá, *Grant 10898* (US, WIS); Santa Marta, *Smith 2173* (US). META: 4 km NW of Villavicencio toward Bogotá, *Luteyn et al. 4799a* (US). PUTUMAYO: Puerto Ospina, *Schultes and Cabrera 18946* (US, WIS). SANTANDER DEL SUR: Vicinity of Puerto Berrio, *Haught 1809* (US). TOLIMA: Mariquita, *Uribe 3324* (MO). VALLE DEL CAUCA: Cisneros, Dagua Valley, *Killip 11481* (US); El Aguacate, Río Yurumangui, *Cuatrecasas 16147* (US). VAUPÉS: Yurupari, *Allen 3282* (MO, US); Puerto Hevea, *Grassl 10032* (US).

COSTA RICA, ALAJUELA: Vicinity of Los Chiles, Río Frio, *Holm and Iltis 967* (US); La Catarata de San Pedro de San Ramón, *Brenes 20579* (NY); Río Naranjo, *Tonduz 7641* (US); 2 km W of La Marina, *Pohl and Davidse 11266* (US). CARTAGO: Vicinity of Pejivalle, *Standley and Valerio 47133* (US); Turrialba, near Reventazón River, *Calderón 2104, 2105* (US), *Holm and Iltis 57* (NY), *King 5347* (US), *Pohl and Davidse 10827, 10836* (US). GUANACASTE: Bebedero, *Brenes 12586* (NY); between Bebedero and Paso Hondo, *Brenes 13110* (NY); Bebedero, Hacienda Catalina, *Jiménez 719* (US); 5 km N of Cañas, Finca La Pacífica, *Pohl and Davidse 10542* (US); 1 km W of Cañas Dulces, *Pohl and Davidse 10575* (US); between Colônia Carmona y Buena Vista, *Jiménez 377* (US); along the Río Corobici, about 4 km NW of Cañas, *Taylor 18049* (US); 10 km S of La Cruz along the Carretera Interamericana, *Pohl and Davidse 10600* (US); 6 km NE of Las Juntas, *Pohl and Davidse 10962* (US); Naranjos Agrios, *Standley and Valerio 46451* (US). HEREDIA: On road to Puerto Viejo, 20 mi [32 km] N of San José, *Lathrop 5557* (US). LIMÓN: Near Río Barbilla, *Cufodonti 659* (US); Río Hondo, *Calderón 2114* (US); 4 km SW of Río Hondo, *Soderstrom et al. 1211, 1215* (US, WIS); Río Madre de Dios, *Calderón 2112* (US). PUNTARENAS: Finca Los Helechales, between Buenos Aires and Cerro Pittier, *Hatheway 1685* (US); 5 km NW of the Carretera Interamericana in Boruca area, *Pohl and Davidse 11148* (US); Finca Volcán Angel, *Schubert and Rogerson 770* (US); 5 km SW of Rincón, Osa Peninsula, *Pohl and Davidse 10715* (US); Santo Domingo de Golfo Dulce, *Tonduz 10082* (US). SAN JOSÉ: 22 km E of Dominical, *Pohl and Davidse 11233* (US); vicinity of El General, *Skutch 4055, 4237* (NY, US); San José, *Hitchcock 8503* (US).

CUBA, CAMAGÜEY: Vicinity of La Gloria, *Shafer 13* (US); Sierra Cubitas, *Shafer 528* (US). HABANA: Caibarien, *Ansovin 387* (US); Junto, *Baker and Wilson 584* (US); Loma de Coca, *Ekman 1000* (US), *1217* (US); Anafe, *Ekman 1040* (US). ISLA DE PINOS: Sierra San Juan del Mar, *Britton et al. 14648* (US); Nueva Gerona, *Curtiss 293* (US); Swetland Ranch, San Francisco de las Piedras, *Killip and Swetland 41637* (US); La Ceiba region, *Killip 43647* (US); Sierra Las Casas, *Killip 44181* (US); Managua, *Palmer and Riley* 1058 (US). MATANZAS: San Miguel de los Baños, *Killip 13864* (US). ORIENTE: El Cristo, *Ekman 1450* (US); Baracoa, *Pollard et al. 53* (US); Río Matamoros S of Holgüin, *Shafer 1348* (US); Alto Cedro to Paso Estancia, *Shafer 1630* (US); Piedra Gorda, *Shafer 3488* (US); Coastal cliffs near Río Yamurí, *Shafer 7840* (US); La Perla, *Shafer 8537* (US). PINAR DEL RÍO: Vinales, *Killip 13533* (US); Sierra San Juan, above San Blas, *Morton 4140* (US); Santa Cruz to Rangel, *Morton 4436* (US); El Guama, *Palmer and Riley 216* (US); Limestone hills between Río Cayaguateje and Sierra Guane, *Shafer 10455* (US); vicinity of Sumidero, *Shafer 13499* (US); Buenaventura, *Wilson 9247* (US); Sierra de Anafe, *Wilson 11582* (US). SANTA CLARA: Limones, *Jack 6234* (US), *Pringle 70* (US); Banao, *León 3990* (US); Sancti Spiritus, Sierra de Gavilanes, *León and Clement 6621* (US). PROVINCE UNKNOWN: Herradura, 16 Mar 1906, *Hitchcock s.n.* (US); Marianao, *Leon 583* (US).

DOMINICAN REPUBLIC, AZUAY: Without locality, *Rose 3986* (US). BARAHONA: Paradis, *Abbott 1636* (US). DUARTE: Los Franceses, near Gaspar Hernández, *Jiménez 2451* (US). LA VEGA: Cotuy, *Abbott 737b* (US); Piedra Blanca, *Allard 13331* (US), 13602 (US); Sierra Prieta, *Jiménez 1169* (US); El Pino, *Jiménez 4404* (US). PUERTO PLATA: La Rosa, *Eggers 2466* (US). SAMANÁ: Sánchez, *Abbott 145* (US), *Rose 4343* (US); Pilón de Azucar, vicinity of Laguna, *Abbott 429* (US). SANTO DOMINGO: Río Ozama, *Ekman 12522* (US). SEIBO: San Pedro de Macoris, *Rose 4203* (US). TRUJILLO: Valdesia valley, *Allard 17315* (US); La Nassa, *Faris 269* (US).

ECUADOR, AZUAY: Balao, *Eggers 14407, 14669* (US). BOLÍVAR: 5 km W of Echeandia on road to Guaranda, *Young 11* (US). ESMERALDA: Environs of Lita, on the Ibarra-San Lorenzo railroad, *Madison et al. 5049* (US). GUAYAS: Río Guayas, west of Guayaquil, *Hitchcock 19962* (US). LOS RÍOS: Hacienda Clementina on Río Pita, *Asplund 5403* (US); Río Palenque Biological Station, *Dodson and McMahon 5032* (US). MANABÍ: El Recreo, *Eggers 15068* (US); near Guale, *Haught 3065* (US). NAPO-PASTAZA: Without locality, *Asplund 8917* (NY); environs of Limoncocha, *Madison et al. 5446*

(US). ORO: Between Santa Rosa and La Chorita, *Hitchcock 21126, 21134* (US); Portovelo, *Holway and Holway 1002* (US). SANTIAGO-ZAMORA: Río Upano valley, *Camp 1438* (US); hills W of Río Upano, along Río Chupiangas, *Prieto 12* (US).

EL SALVADOR, CHALALTENANGO: along road to Chalaltenango, 3 km E of Hwy. 4, *Pohl and Davidse 11879* (MO). CUSCATLÁN: Hacienda Chanqueso sudl. Suchitoto, *Bachufer and Lehmboden 2430* (MO). LA UNIÓN: Vicinity of La Unión, *Standley 20810* (US). SAN SALVADOR: San Salvador, *S. Calderón 491* (US), *Hitchcock 8856* (US), *Standley 23199* (US); Volcán de Guazappa, *Pohl and Gabel 13626* (MO). SANTA ANA: Santa Ana, *Hitchcock 8842* (US); 2 km SE of Metapán, *Pohl 12593* (MO). SAN VICENTE: Vicinity of San Vicente, *Standley 21691* (US). SONSONATE: Vicinity of Sonsonate, *Standley 22355* (US). PROVINCE UNKNOWN: Cerro de La Olla, near Chalchuapa, *S. Calderón 1047* (US); San Andrés, *Kovar 1002* (US); Santa Carlota, *S.Calderón 941* (US).

FRENCH GUIANA: Chemin des Emerillons, km 6, *Lescure 204* (US); Maroni, *Melinon 121* (WIS).

GUATEMALA, ALTA VERAPAZ: S of Cubilquitz, *Steyermark 44545* (US); Cubilquitz, *von Turckheim II 845, 4037, 8619* (US), *8478* (NY); vicinity of Secanquim, *Pittier 256* (US). HUEHUETENANGO: Between Ixcán and Río Ixcán, Sierra de los Cuchumatanes, *Steyermark 49332* (US). IZABAL: Vicinity of Puerto Barrios, *Standley 24813* (US); vicinity of Quiriguá, *Standley 24676* (US); N of Quiriguá, *Weatherwax 84* (US); Sierra del Mico, between Los Amates and Izabal, *Kellerman 7346* (US). JUTIAPA: 8 mi [13 km] SW of San Cristobal, *Dunn et al. 23274* (MO). LIVINGSTON: Livingston, *von Turckheim II 1224* (US). PETÉN: Dolores, on Río Mopán trail, *Contreras 3052* (US); La Libertad, *Aguilar 47* (US, WIS), *Lundell 3610* (US); Tikal National Park, Tikal, *Contreras 3725* (US), *Lundell 15741* (US). RETALHULEU: Retalhuleu, *Kellerman 6274* (US). SUCHITEPEQUEZ: Mazatenango, *Heyde and Lux 6400* (US).

GUYANA: Kanuku Mountains, near Moco-Moco village, *Maas et al. 3921* (US); Kanuku Mountains, forest trail to Mt. Iraimakipang, *Goodland and Maycock 471* (US).

HAITI: Massif de la Selle, Riviére Froide, *Ekman 6622* (US); Gonave Island, *Eyerdam 127* (US); La Table, vicinity of Anse Galette, Gonave Island, *Leonard 3241* (US); vicinity of Pikmi, Gonave Island, *Leonard 5122* (US); vicinity Port-au-Prince, *Holdridge 1868* (US), *Leonard 5269a* (US); vicinity Cap-Haitien, *Leonard 5292* (US); vicinity Michel de l'Atalaye, *Leonard 7273* (US), *8039* (US); vicinity of La Vallée, Tortue Island, *Leonard and Leonard 11452* (US).

HONDURAS, ATLÁNTIDA: Lancetilla Valley, *Chickering 191* (US); vicinity of La Ceiba, *Yuncker et al. 8285* (NY, WIS), *8476* (NY), *8822* (NY); Puerto Sierra, *Wilson 352* (NY, US); near Tela, *Standley 52707, 52937, 54131* (US); 3 mi [5 km] S of Tela, *Miller 12677* (US). CHOLUTECA: 1 km W of El Corpus, *Pohl and Davidse 12383* (MO). COLÓN: 4.5 mi [7 km] NE of Trujillo on road to Castilla, *Saunders 588* (MO). COMAYAGUA: Esquias, 75 km E of Comayagua, *Hernández 112* (MO); alrededores del lago Yojoa, *Duenas 86* (MO). COPÁN: Hacienda Ocoteseco, 20 km NE de Santa Rosa de Copán, *Portillo 1* (MO); 4 mi [6.5 km] NE of Santa Rita, *Molina and Molina 30834* (MO). CORTÉS: NE shore of Lake Yojoa, *Williams and Williams 18741* (US); San Pedro Sula, matorrales of Río Piedras, *Molina 5227* (US); road San Pedro Sula-cortes, near Choloma, *Molina 6669* (US); Pimienta, Río Ulua, *Molina 5640* (US). EL PARAÍSO: Road to Danlií, woods along Río San Francisco, *Swallen 11245* (US). FRANCISCO MORAZÁN: Río Orilla, faldas del Cerro Majicarán, *Molina 1534* (MO). ISLAS DE LA BAHIA: Roatán Island, 4 km E of Coxenhole, *Molina 20740* (US). OLANCHO: 5 km de Juticalpa, *Pereira 44* (MO); 22 km ENE of Juticalpa, *Pohl and Davidse 12420* (MO). VALLE: Amapala, *Valerio Rodríguez 3397* (US). PROVINCE UNKNOWN: Cuyamel, *Carleton 445* (NY, US).

JAMAICA: Ferry River, *Harris 11320* (US); above Gordon Town, *Harris 11346* (US), *11436* (US); Louis River, near Castleton, *Harris 11537* (US); Troy, *Harris 12571* (US); Bog Walk to Spanish Town, *Hitchcock 9298* (US); Ewarton to Linstead, *Hitchcock 9410* (US); near Ipswich, *Hitchcock 9623* (US); Bath, *Maxon 2367* (US); near Ipswich, St. Elizabeth, *Maxon and Killip 1522* (US); Stoney River Base camp, Portland, *Morley and Whitefoord 680* (US).

LEEWARD ISLANDS, ANTIGUA: McCarthy valley, *Box 77* (US). DOMINICA: Near Carholm Estate, Layou River Valley, *Ernst 1943* (US); banks of Layou River across from Clarke Hall, *Stern and Wasshausen 2391* (US); Clyde River Valley, SW of Melville Hall airfield on road to Governor Estate, *Ernst 1037* (US); Layou River Valley, Clarke Hall Estate, *Ernst 1712* (US). GUADELOUPE: Without locality, *Duss 3147* (US); Ste. Rose, *Questel 851* (US); Petite Montagne, *Questel 4097* (US); Roche Blanche, *Stehle 1787* (US); Côte de Baillif, *Stehle 5942* (US); Calumet, *Stehle 6244* (US). MARTINIQUE: Without locality, *Hitchcock 16442* (US); Montagne, *Stehle 3731* (US).

MEXICO, CHIAPAS: Escuintla, *Matuda 341* (US); Finca Irlanda, *Purpus 7401* (NY, US); N of Mapastepec, *Sharp X-176* (US); near the junction of the Río Perlas and Río Jatate at San Quintín and near Laguna Miramar, *Sohns 1705* (US); Sierra Madre, *Tateoka 1133* (US). GUERRERO: Carretera a El Paraíso, 21 km al NE de Atoyac, near Río Santiago, *Koch et al. 79303* (US). JALISCO: 12 km NE of Nacastillo, *Iltis and Nee 1536* (IBUG, US, WIS); 10–13 km SE of El Tuito, *McVaugh 25405* (US); 5 km W of Puerto Vallarta, *Soreng 2186* (US). MICHOACÁN: Aquila, *Hinton et al. 16137* (NY, US); 32 km N of Playa Azul, *King and Soderstrom 4924* (NY, US). NAYARIT: 6–7 mi [~10 km] S of Las Varas, road to La Cucaracha, *McVaugh 19192* (US); 1–1.5 mi [~2 km] above La Cucaracha, 12–13 mi [~20 km] S of Las Varas, *McVaugh 19218* (US); along the road to Miramar and Santa Cruz, 15 km SE of San Blas, *Feddema 1006* (US); vicinity of San Blas, trail to Ensenada de Matanchen, *Ferris 5366* (US); 5 mi [~8 km] E of San Blas, *Reeder and Reeder 2421, 2422* (US). OAXACA: Vicinity of Cafetal Concordia, *Morton and Makrinius 2700*

(US); Chiltepec, *Martínez-Calderón 45* (US); Huantla de Jiménez, *Schultes 824* (US); 5 km N of Matías Romero, *King 799* (US, WIS); between Ojillán and Jalapa de Diaz, *Conzatti 3764* (NY, US); San Pedro de Tepinapa, Santiago de Jocotepec, *Vera Santos 3410* (US), *3411* (NY, US); Ubero, *Williams 9335* (US). QUINTANA ROO: Coba, *Lundell 7698* (US). SAN LUIS POTOSÍ: Micos, *Pringle 3795* (NY, US); between Narango-Platinito-Salto de Agua, *Sohns 1412, 1413* (US); Tamasopo, *Pennell 18013* (US). TABASCO: Arroyo de Tapijuhiya, *Rovirosa 43* (US). TAMAULIPAS: Rancho El Cielito, valle del Río Sabinas, *McDonald 890* (MO). VERACRUZ: Misantla, *Purpus 5976* (US); Barranca de Pancaya, *Purpus s.n.* (US); vicinity of Río Tonto, *Vera Santos 2270* (NY). YUCATÁN: Chichen Itzá, *Swallen 2428, 2467* (US).

NICARAGUA, BOACO: N slope of Cerro Mombacho, *Stevens and Grijalva 14711* (MO); 1–2 km SE of Santa María, along Río Fonseca, *Nee et al. 28009* (MO). CARAZO: 13 km SW de Diriamba, *Moreno 24314* (MO). CHINANDEGA: Ameya, *Maxon et al. 7190* (NY, US). CHONTALES: Hacienda Veracruz, including Cerro La Batea and Cerro Los Charcos, *Stevens 22253* (MO), *23277* (MO). GRANADA: Low hills near Granada, *Maxon et al. 7611* (NY, US); Finca Cutirre, NW de Volcán Mombacho, *Sandino 1272* (MO); 5 km N de Nandaime, *Moreno 9905* (MO). LEÓN: Quesalguague, *Baker 2105* (US). MANAGUA: Vicinity of Managua, *Garnier 817* (US); camino a Salamina, Hacienda Santa Cruz, *Guzmán and Castro 151* (MO). MATAGALPA: 11 km NE de Muy Muy, *Moreno 24431* (MO); Quebrada Santa Cruz, between Puertas Viejas and Esquipulas, *Stevens 22343* (MO). NUEVA SEGOVIA: 7 km NE de El Jícaro, *Moreno 1672* (MO). RÍO SAN JUAN: 5 km SE of Río Oyate, *Nee and Miller 27584* (MO). RIVAS: Isla de Ometepe, *Moreno 22064* (MO), *Robleto 961* (MO), *1349* (MO). ZELAYA: Río Escondido, Bahia de Bluefields, *Molina 1909* (US). PROVINCE UNKNOWN: Jinotepe, *Hitchcock 8721* (US); El Rodeo, *Garnier 1518* (US).

PANAMA, BOCAS DEL TORO: Isla Colón, vicinity of Chiriqui Lagoon, *von Wedel 1343* (US). CHIRIQUÍ: 2 mi [3.2 km] SW of Puerto Armuelles, *Croat 22060a* (MO); San Bartolo Arriba, *Croat 26697* (MO). COCLÉ: El Valle, *Croat 25272* (MO). COLÓN: Vicinity of Ancón, *Piper 5226* (US); Balboa, *Standley 25437* (US); Barro Colorado Island, *Bailey and Bailey 17* (US), *Calderón 2101* (US), *Ebinger 145* (US), *Standley 31335, 41009* (US), *Stimson 5288* (US); Chiva-Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 5229* (US), *Maxon and Harvey 6580* (US); Pedro Miguel to Culebra, *Hitchcock 7919* (US); around Frijoles, *Pittier 2686, 3759* (NY, US); hills N of Frijoles, *Standley 27533* (US); Gatún, *Hitchcock 7983* (US); Madden Dam, *Dwyer and Elias 7486* (US); vicinity of Río Cocolí, Road K-9, *Stern et al. 310* (US); along the Río Culebra, above Santa Isabel, *Pittier 4151* (US); Río Pedro Miguel, near East Paraíso, *Standley 29937* (US); trail toward Chico, *Steyermark and Allen 17458* (US); Portobello, Las Cruces Trail, *Ebinger 106, 114* (US, WIS); vicinity of Palenque, *Pittier 4126* (NY, US). DARIÉN: Vicinity of Campamento Buena Vista, Río Chucunaque above confluence with Río Tuquesa, *Stern et al. 854* (US); near helipad at Hydro Camp on Río Morti, *Duke 15418* (US); vicinity of Paya, Río Paya, *Stern et al. 207* (US). HERRERA: 10 km N of Las Minas on road to El Toro, *Sytsma and D'Arcy 3242* (MO); 18 km W of Las Minas, N slope of Cerro Alto Higo, *Hammel 4224* (MO). PANAMÁ: Agricultural Experimental Station at Matías Hernández, *Pittier 6643* (US); Alhajuela, *Dwyer 1038* (US), *Pittier 2339* (NY, US), *3470* (US); 3 km from Cañitas toward the Bayano Dam, *Calderón and Dressler 2151, 2157* (US); Juan Diaz, *Killip 4089* (US), *Standley 30607* (US); vicinity of Panama, *Hitchcock 8101* (NY, US); Pedro González, Panama Bay, Perlas Islands, *Allen 2596* (US); ~2 mi [3.2 km] up Río La Maestra, *Kennedy 1183* (US); about 3–4 mi [5–6 km] upstream on Río Pasiga, *Kennedy 1205* (US); near Río Mato Puerco, *Erlanson 185* (US); San José Island, Pearl Archipelago, East Harbor, *Erlanson 250* (NY, US), *305* (US), *Johnston 100, 462* (US), *Stimson 5316* (US). SAN BLAS: Cangandí, *de Nevers and Herrera 5665* (MO). VERAGUAS: 4 km W of Colonia Penal, *Antonio 2230* (WIS); vicinity of Santiago, *Stern et al. 991* (US). PROVINCE UNKNOWN: Vicinity of Bella Vista, *Piper 5290* (US); road to Corozal, *Gervais 143* (US); Camino de Las Sabanas, *Heriberto 194* (NY, US); near Old Fort Lorenzo, mouth of Río Chagres, *Piper 5949* (NY, US); vicinity of San Félix, eastern Chiriquí, *Pittier 5206* (NY, US).

PARAGUAY: Picada Chiriguelo, Sierra de Amambay, *Rojas 6861* (US); Santa Teresa, *Bertoni 1718* (US).

PERU, AMAZONAS: Quebrada Huampami, *Berlin 703* (US). AYACUCHO: Río Apurimac Valley, near Kimpitiriki, *Killip and Smith 22985* (US). CUZCO: Cordillera Vilcabamba, 15 km walking distance from Río Apurimac and Hacienda Luisiana, *Dudley 10055* (MO). HUÁNUCO: Bosque Nacional de Iparia, Río Pachitea, near campamento, Miel de Abeja, *Schunke 1306, 1364, 1930, 2919* (US); Tingo María, *Asplund 12226* (US). JUNÍN: E of Quimiri bridge, near La Merced, *Killip and Smith 24002* (US); Río Paucartambo valley, near Perené bridge, *Killip and Smith 25330* (US). LORETO: Iquitos, *Williams 3752* (US); Río Nanay, upland forest near Zamito, *Plowman 2513* (US); Santa María, about 25 km below Yurimaguas on Río Huallaga, *Allard 22484* (US); trocha Yurimaguas-Tarapoto, *Ferreyra 4959* (US); Río Ampiyacu, environs Puca urquillo, *Davis et al. 811* (US). MADRE DE DIOS: Explorer's Inn, 30 km SW of Puerto Maldonado, *Londoño 15* (US). SAN MARTÍN: Alto Río Huallaga, *Williams 5824* (US); Gamitanacocha, Río Mazán, *Schunke 210* (US); Lamas, *Williams 6465* (US); lower Río Huallaga, *Williams 3802, 4375* (US); San Roque, *Williams 7682* (US); Tarapoto, *Williams 5491, 5873* (US); camino al Pueblo Viejo de Tocache, *Schunke 3777* (US). UCAYALI: Pucallpa, *Soukup 3060* (US). DEPARTMENT UNKNOWN: La Merced, *McBride 5521* (US).

PUERTO RICO: Vicinity of Mayagüez, *Chase 6175* (US), *6177* (US), *Heller 4583* (US), *Sintenis 138* (US), *Soderstrom 1802* (US); vicinity of Maricao, *Chase 6200* (US); NE of Arborito, *Chase 6334* (US); vicinity of Vega Alta, *Chase*

6416 (US); vicinity of Quebradillas, *Chase 6570* (US); between Guainabo road and Bayamón, vicinity of San Juan, *Chase 6645* (US); Sierra de Luquillo, slopes of El Yunque, *Chase 6732* (US); Toa Baja, *McKee 10601* (US); Cayey, *Sintenis 2396* (US); Panuelas, in montibus Llano, *Sintenis 4764* (US); Santa Marta Hills near San Germán, *Stimson 1229* (US); Río Piedras, *Wetmore 172* (US).

SURINAM: Kayser airstrip, 45 km above confluence with Lucie Rivier, *Irwin et al. 55986, 57696* (US); 3 km S of Juliana Top, 12 km N of Lucie Rivier, *Maguire et al. 54423, 54424, 54441, 54858* (US).

TOBAGO: Scarborough, *Broadway 4362* (US), Main Ridge, *Cowan 1488* (US), *1528* (US), *Hitchcock 10221* (US), *10264* (US); Green Hill, *Purseglove 6261* (US); Bacolet, *Sandwith 1629* (US).

TRINIDAD: North Post to Maqueripe, *Britton et al. 876* (US); Caparo Woods, *Broadway 4933* (US); Arima Valley, *Cowan and Simmonds 1195* (US); Tabaquite, *Cowan and Foster 1340* (US), *Soderstrom 1072* (US); Port-of-Spain, *Hitchcock 9968* (US), *9981* (US), *10195* (US), *10326* (US), *10327* (US); San Fernando, *Hitchcock 10105* (US); Aripo Valley, beginning of trail to Aripo Caves, *Kennedy et al. 1705* (US); near Simla, *Smith 10085* (US); St. Joseph Savannah, *Soderstrom 1088* (US); Erin Savanna, *Soderstrom 1127* (US).

UNITED STATES, FLORIDA: Tampa Bay [mixed with *Pharus lappulaceus*], Herb. Chapman (photograph at US of herbarium sheet from unknown source).

VENEZUELA, AMAZONAS: between Río Mawariuma and Río Baria, *Gentry and Stein* 47240 (US). ANZOÁTEGUI: Cerro La Danta, NE of Bergantín, *Steyermark 61101* (US). APURE: Departmento Páez, 25 km by car E of El Nuba, *van der Werff and Gonzalez 4821* (MO). ARAGUA: Trail behind Biological Station at Rancho Grande, *Luteyn and Luteyn 5182* (US); northern slope of Parque Nacional Rancho Grande, *McClure 21264* (US); near Maracay, *Soderstrom 1359* (US). BOLÍVAR: 17 km W of Río Caura along Hwy. betweem Caicara and Ciudad Bolívar, *Davidse 4442* (WIS); Río Reforma, *Steyermark 88060* (US). CARABOBO: Guaremales, road from Puerto Cabello to San Felipe, *Pittier 8923* (US). COJEDES: Río Pao, Paraima, *Trujillo 5435* (MO); entre Hacienda Mata Clara y El Baula, *Aymard et al. 2303* (MO). DELTA AMACURO: 13 km ESE of town of Sierra Imata, *Davidse and González 16620* (MO). DISTRITO FEDERAL: Cerro Naiguatá, *Steyermark 92143* (US). FALCÓN: Maparari, 11 km E de Churuguara, *Wingfield 6509* (MO). MÉRIDA: near Bolero, along Río Onia, *Steyermark 56708* (US). MIRANDA: 3 km SW of Aragaita, *Davidse 4105* (WIS); Guinand Estate, Siquire Valley, *Pittier 5941* (US). MONAGAS: Quiri Quiri to Caripito, *Chase 12581* (US). NUEVA ESPARTA: Juan Griego Trail, Isla Margarita, *Johnston 314* (US). PORTUGUESA: 30 km W of Guanare by air, along Río Tucupido, *Liesner et al. 12638* (MO); 17 km NW of Tucupido, *Davidse et al. 21469* (MO). SUCRE: Cerro Patao, N of Puerto Hierro, *Steyermark and Agostini 91165* (US). TÁCHIRA: The Balcon, vicinity Cristobal Colón, *Broadway 445* (US). YARACUY: Departmento San Felipe, Municipio Veroes, 5 km S de Bella Vista, *Agostini et al. 795* (MO). ZULIA: Vicinity of Mene Grande, *Pittier 10647* (US). STATE UNKNOWN: Eleanor Creek, lower Orinoco, *Rusby and Squires 357* (US).

VIRGIN ISLANDS, ST. THOMAS: *Eggers 289* (US), *673* (US). TORTOLA: *Britton and Shafer* 835 (US).

WINDWARD ISLANDS, GRENADA: Morne Delice, *Beard 571* (US); Azimar Mountains, 18 Oct 1905, *Broadway s.n.* (US). SANTA LUCIA: *Hitchcock 16357* (US), *16479* (US). SAINT VINCENT: Kingshill, *Beard 1371* (US).

ADDITIONAL OLD WORLD SPECIMENS SEEN.—ANGOLA: Dundo, poximum flumen Luachimo, *Gossweiler 14211* (US); River Luovwa, Moxico District, *Milne-Redhead 4176* (US).

BURUNDI: Bururi, Rumonge, foret de Kigwena, *Reekmans 1519* (MO), *4849* (MO).

CAMEROON: Mbalmayo, *Jacques-Félix 9142* (US); Mimbia, *Zenker 164* (US); Yaoundé, *Zeuillen 220* (US).

CENTRAL AFRICAN REPUBLIC: Manovo-Gounda-St. Floris National Park, 0.5 mi [1 km] downstream of Koumbala-Pende confluence, *Fay 6061* (MO); Niao River 4 km S of Sakala Road, *Fay 7412* (MO).

COMORO ISLANDS: Mayottem Hachiroungou massif, *Lorence and Saida 2861* (MO).

CONGO: Paysoles M'brous, *Chevalier 5766* (US).

ETHIOPIA: 6 km SE of Tippi, 7°09′N, 35°23′E, *Meyer 8026* (US).

GABON: Ndjole, *Thollon 723* (US).

GHANA: Ejura, *Vigne 3454* (US); Kumasi, *Yamoah 623* (US).

GUINEA: Mt. Nimba, *Adam 3155* (MO); Dendano, *Adam 3619* (MO); Nzerekore, *Adam 5343* (MO); Bogbozou, *Adam 5564* (MO); Mt. Kouyo, *Adam 5798* (MO); Singuedou, *Adam 6205*; Kindia, Seguea, *Adam 12635-1* (MO).

IVORY COAST: Several km SE of Zie-Noa bridge, near Kange Yanze, *Fosberg 40485* (US).

KENYA: Meru Dist., lower Imenti Forest, on Meru-Mikinduri road, *Faden and Faden 78-894* (MO).

LIBERIA: Nyaake (Webo), Webo Dist., *Baldwin 6086*; Jabroke (Palipo), Webo Dist., *Baldwin 6698* (US); near Soplima, Vonjama Dist., *Baldwin 10059*.

MADAGASCAR: Bassin de la Manampanihy, *Humbert 6042* (US).

MALAWI: Lujeri Estate, Mlanje, *Wiehe 714* (US).

MOZAMBIQUE: Amatongas forest near Gondola, *Fisher and Schweickerdt 271* (US); Garuso, *Fisher and Schweickerdt 288* (US); Tzengannedose, *Gómes and Sousa 4375* (US); Vila de João Belo, Chipenhe, na floresta de Chirindzene, *de Lemos and Balsinhas 49* (US).

NIGERIA: Abugi, Kabba Prov., *Clayton 623* (US).

SENEGAL: Tambacounda, Niokolo koba, *Adam 17425* (MO); Ziguinchor, Bayottes, *Adam 13713* (MO).

SIERRA LEONE: Jala, 20 Jan 1927, *Fairchild s.n.* (US).

SOUTH AFRICA: Ngoya, Zululand, 18 Apr 1895, *Wylie*

s.n. (US).

TANZANIA: Magenga forest, *Faulkner 1201* (US); Languga, Usambaras Dist., *Greenway 424* (US); Amani, *Hitchcock 24509* (US); Moshi, *Hitchcock 24555* (US).

UGANDA: Musole forest, *Barkley 3231* (US); Kyewaga forest, Busiro County, *Dawkins 369* (US); Nipayo, *Dümmer 667* (US); Budongo forest, *Loveridge 168* (US).

ZAIRE: Yambata, *De Giorgi 7422* (US); Parc National Garamba, Terr. Dungu, *Troupin 790* (US); Dima, *Vanderyst 5237* (US); Mokaba, *Vanderyst 5600* (US).

ZIMBABWE: Chirinda Forest, *Crook 1088* (MO), *Pardy and Armitage 26* (MO); Inyanga, Pungwe, *Wild 5274* (MO).

DISCUSSION.—*Olyra latifolia* is a common, coarse, scandent species of forest margins and secondary forests throughout the Neotropics. It is naturalized and widespread in tropical Afri~ There are both diploid and tetraploid populations. Recorded chromosome counts include n = 22 (Davidse and Pohl, 1974, 1978; Hunziker et al., 1982), 2n = ~30 (Gould and Soderstrom, 1967, as *O. cordifolia*), 2n = 22 (Reeder, 1969, Gould and Soderstrom, 1970, Kammacher et al., 1973), n = 11 (Pohl and Davidse, 1971, Davidse and Pohl, 1972a), and n = 11, 22 (Davidse and Pohl, 1972b, Olorode, 1975, Dujardin, 1978).

13. *Olyra latispicula* Soderstrom & Zuloaga, new species

FIGURES 11, 17*c*, 18, 19, 20

TYPE SPECIMEN—BRAZIL, BAHIA: Municipio Pôrto Seguro, Parque Nacional Monte Pascoal, located 14 km E of BR 101 at a point 13 km N of Itamarajú, 320 m, 13 May 1976, *Soderstrom, Russell, and Hage 2208* (holotype, CEPEC; isotype, US).

Gramen perenne, rhizomatibus breviter, culmis in fasciculis densis, erectis ~0.70 m longis; nodi incrassati, pilosi. Folia per complementum 10–15; laminae ovatae-lanceolatae, 9–11 cm longae, 2.2–3.8 cm latae, glabratae, basi asymmetricae valde, truncatae, apice symmetricae; pseudopetioli 0.3–0.4 cm longi, pilosi; ligulae membranaceae-ciliatae, ~0.3–0.4 mm longae. Paniculae laxatae, parvae, 5–9 cm longae, 1–3 cm latae. Spiculae femineae lanceolatae, aristatae, 14.8–15.8 mm longae, 3.7 mm latae, virides, glumis inter se inaequalibus; gluma inferior aristata, 5-nervis, nervis tessellatis; gluma superior acuta, 6.6 mm longa, 5-nervis, nervis tessellatis; anthoecium late ovatum, acutum, 5.5 mm longum, 3.7 mm latum, pilosum; lemma 5-nerve, nervis tessellatis. Spiculae masculae lanceolatae, acuminatae, 4.3 mm longae, 0.7 mm latae, scabrae; lemma acuminatum, 3-nerve; palea 3.5 mm longa, 2-nervis.

Short-rhizomatous perennial, 0.70 m tall. *Culms* borne closely together, geniculate-ascending, unbranched at the lower and median nodes; internodes compressed, hollow, short-pubescent with appressed and retrorse hairs; nodes thickened, purplish, glabrous. *Leaves* 10–15 per complement, drooping, rarely ascending in the upper portion of the plant; sheaths striate, greenish to purplish, short-pubescent to glabrescent; ligules membranous-ciliate, ~ 0.3–0.4 mm long; pseudopetiole 0.3–0.4 cm long, brown, long- to short-pubescent with thickened, whitish hairs on both surfaces; blades ovate-lanceolate, 9–11 cm long, 2.2–3.8 cm wide, the upper leaves becoming smaller, strongly asymmetric and truncate at the base, with a symmetric, acuminate tip, glabrous on both surfaces, the margins ciliate to scabrous, with or without short hairs toward the base, the midnerve prominent. *Inflorescence* paniculiform, 2 or 3 borne at the upper nodes of the culms; peduncles long, ~8–10 cm long, with short, retrorse hairs; panicles few-flowered, 5–9 cm long, 1–3 cm wide, the branches divergent from the axis, the lowermost whorled, occasionally alternate, the upper ones alternate, the lower branches bearing male spikelets only, with the spikelets paired, one short- and the other long-pedicelled, the upper branches with male spikelets at the base and a terminal female spikelet or with female spikelets only; *axis* longitudinally ridged, hispid on the lower part, otherwise glabrous, pedicels of the male spikelets purplish, scabrous, those of the female spikelets thickened, smooth and glabrous. Axillary panicles similar to the terminal one but smaller. *Female spikelets* lanceolate, aristate, 14.8–15.8 mm long, 3.7 mm wide, greenish with unequal glumes; *lower glume* long-aristate, scaberulous, 5-nerved with transverse veinlets; *upper glume* acute, 6.6 mm long, glabrous, 5-nerved with transverse veinlets; a short stipe present at the base of the anthecium; *anthecium* broadly ovoid, strongly compressed, acute apically, 5.5 mm long, 3.7 mm wide, with conspicuous, caducous, long prickle hairs over the entire surface; lemma gibbous, depressed on the dorsal face along either side of the midnerve, 5-nerved with transverse veinlets. *Male spikelets* lanceolate, acuminate, 4.3 mm long, 0.7 mm wide, reddish, scabrous; *lemma* acuminate, 3-nerved with the midnerve scabrous toward the apex; *palea* 3.5 mm long, 2-nerved, scabrous toward the apex; anthers 2.2 mm long.

DISTRIBUTION.—Known only from the type locality, in lowland wet forest on the slopes of Monte Pascoal in southern Bahia, Brazil (Figure 11).

DISCUSSION.—*Olyra latispicula* is a very distinctive new species, unusual in its broad, slightly apiculate female anthecium, with the lemma gibbous and the whole surface covered by conspicuous prickle hairs. The plants are delicate and small, with asymmetric leaves that have truncate bases. Its affinities with other species in the genus are not obvious.

14. *Olyra longifolia* Humboldt, Bonpland & Kunth

FIGURES 21, 22, 23

Olyra longifolia Humboldt, Bonpland & Kunth, 1816:198. [Type: "Crescit in humidis Guyanae ad ripam fluminis Guaviare, prope San Fernando de Atabapo, in sylvis Orinocensibus prope Santa Barbara." Holotype P, not seen, fragment of the holotype, US sheet no. 2877943.]

Olyra surinamensis Hochstetter ex Steudel, 1853:36. [Type: "Hrbr. Dr.

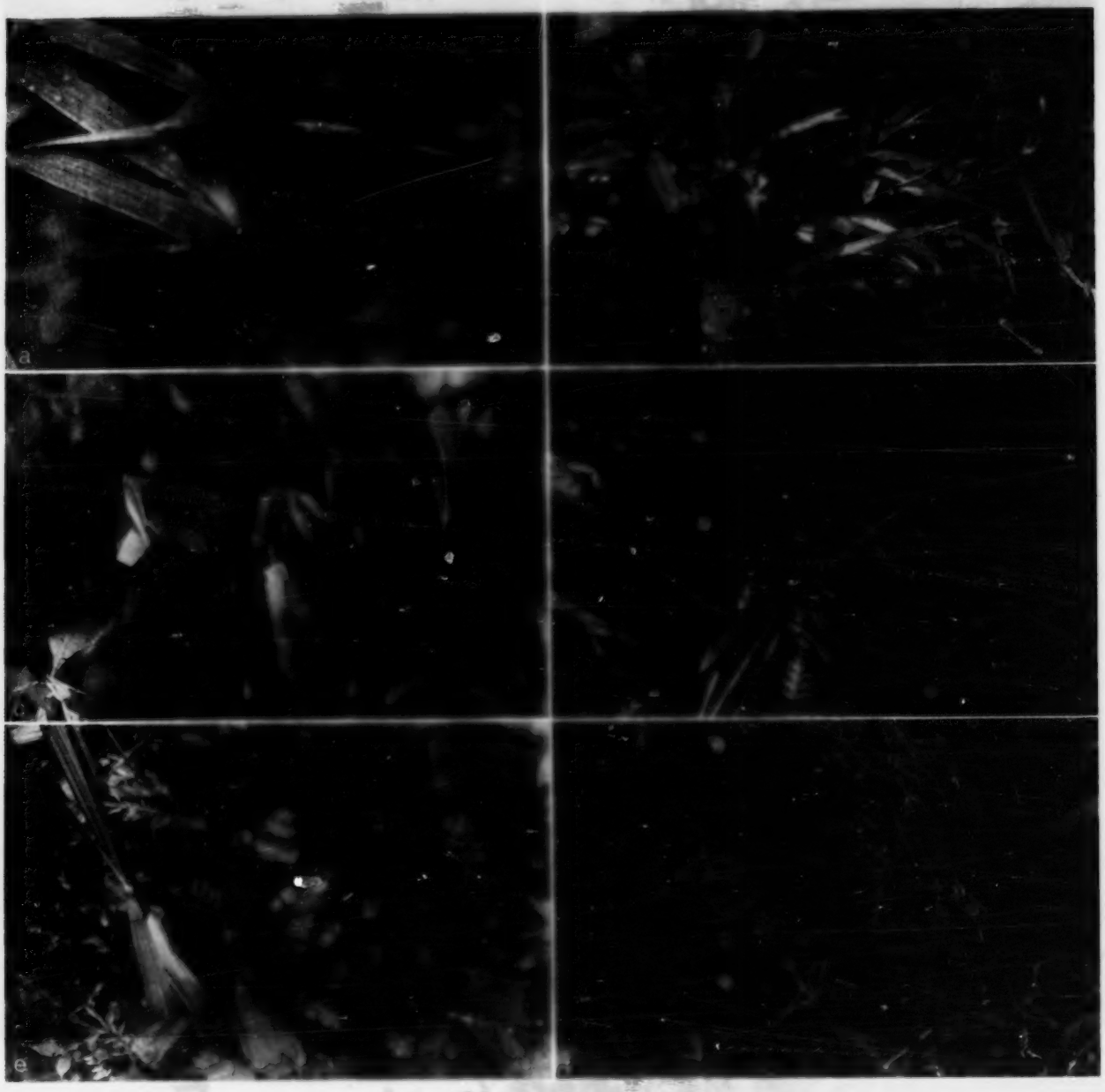

FIGURE 17.—Field photos of *Olyra* species. *O. filiformis*: *a*, detail of panicles; *b*, habit of plant (Bahia, Brazil, 1972). *O. latispicula*: *c*, habit of plant (Bahia, Brazil). *O. micrantha*: *d*, habit of plant (Brazil, 1968); *f*, detail of panicles. *O. jurucana*: *e*, habit of plant (Brazil, 1976). Photographs by C.E. Calderón, except *c* by T.R. Soderstrom.

Hostmann nr. 863. Surinam." Holotype, P, not seen, fragment of the holotype, US sheet no. 2877922, isotype, MO.]

Olyra longifolia var. *grandifolia* Doell in Martius, 1877:325. [Type: Based on *O. longifolia* Humboldt, Bonpland & Kunth, 1816:198.]

Olyra longifolia var. *parvifolia* Doell in Martius, 1877:325. [Type: "In vicinis provinciae Manaos do Alto Amazonas a cl. *R. Spruce* lecta (n. *880* et *1145*, nomine Olyrae acutinodae in ejus herbario signata)." Syntype *Spruce 880* not seen; syntypes of *Spruce 1145*, NY, P, US, fragment of syntype, *1145*, US sheet no. 84571.]

Olyra kegelii Mez, 1921:6. [Type: "Holl. Guyana (*Kegel n. 251*)." Holotype, B, fragment of the holotype, US.]

Perennial in cespitose clumps, short-rhizomatous. *Culms* 0.30–5 m tall, simple below, branching at the upper nodes,

FIGURE 18.—*Olyra latispicula*: *a*, habit (× 0.5); *b*, inflorescences from upper nodes (× 0.5); *c*, pseudopetiole and ligule (× 5). Based on *Soderstrom et al. 2208* (US). Illustration by A.R. Tangerini.

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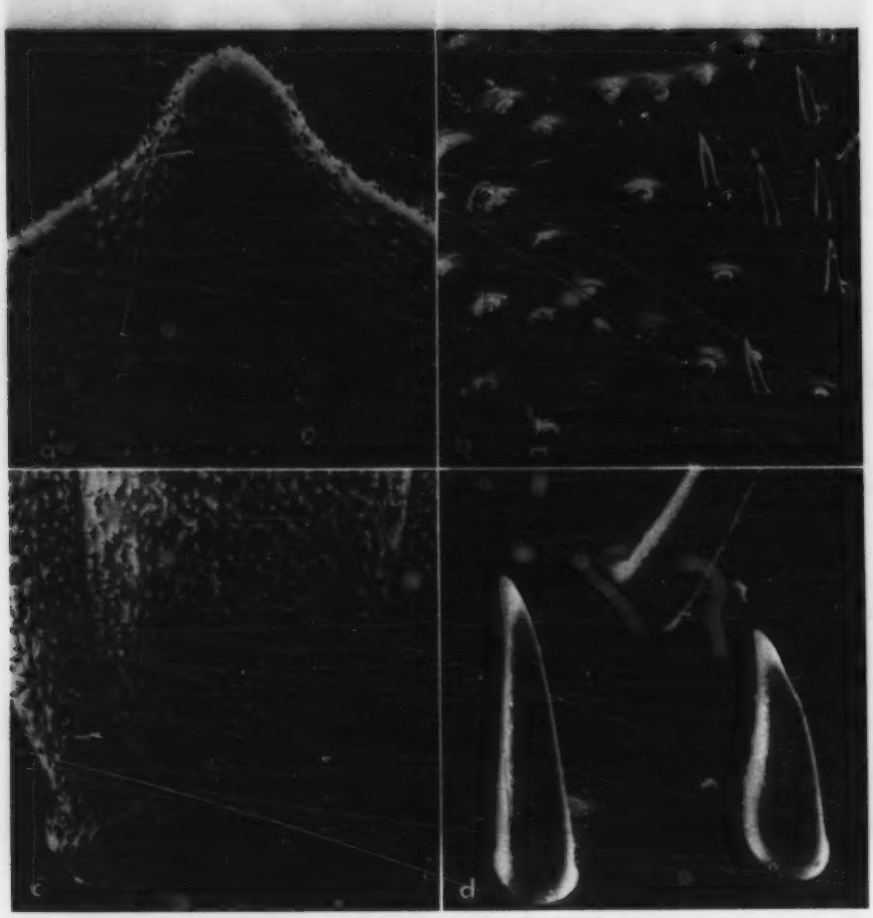


FIGURE 20.—Detail of female anthecium, *Olyra latispicula*: *a*, apex of the anthecium, ventral side (× 50); *b*, detail of the surface showing caducous prickle hairs (× 200); *c*, base of the anthecium, ventral side (× 50); *d*, prickle hairs (× 1000). All micrographs of *Soderstrom et al. 2208* (US). (Reduced to 77% of indicated magnifications for publication.)

erect or rarely clambering; internodes cylindrical, hollow, shiny, glabrous; nodes thickened, short-pubescent with whitish hairs. *Leaves* with sheaths strongly ribbed, densely pubescent toward the summit, the rest of the surfaces short- to long-pubescent to glabrous; auricles absent; ligules membranous-ciliate, ~0.6 mm long, brownish, short-pubescent on the abaxial surface; pseudopetiole 0.2–0.5 cm long, pale to purplish, pubescent with short, appressed hairs to glabrescent; blades lanceolate, 5.5–21 cm long, 1.2–5.7 cm wide, ascending, with a subcordate to narrowed and symmetric base, the apex either symmetric or asymmetric, glabrous on the adaxial surface, glaucescent and hispid on the abaxial one, the upper margins ciliate, the midnerve prominent. *Inflorescences* racemiform, usually with 2 to many panicles borne from the uppermost nodes, all the panicles almost reaching the same height, the peduncles short-pubescent; panicles 3.5–7.5 cm long, 1–2 cm wide, with male and female spikelets borne in different branches, usually with 2–5 branches with male spikelets at the base, one of these branches longer than the other ones; pedicels of the male spikelets slender, scabrous; female spikelets 4–12, disposed alternately on one branch; pedicels of the female

FIGURE 19.—*Olyra latispicula*: *a*, habit and inflorescence (× 4); *b*, female spikelet (× 8); *c*, lower glume of female spikelet (× 8); *d*, upper glume of female spikelet (× 8); *e*, female anthecium, palea side (× 8); *f*, lemma of female spikelet, inside view (× 8); *g*, lemma of female spikelet, outside view (× 8); *h*, palea of female spikelet, outside view (× 8); *i*, palea of female spikelet, inside view (× 8); *j*, same as *i*, apex opened (× 8); *k*, gynecium (× 8); *l*, male spikelet (× 12); *m*, lemma of male spikelet, inside view (× 12); *n*, palea of male spikelet, with stamens enclosed (× 12); *o*, palea of male spikelet, inside view (× 12); *p*, andrecium and lodicules (× 16.5); *q*, lodicules of male spikelet (× 24). All components based on *Soderstrom et al. 2208* (US). Illustration by A.R. Tangerini.

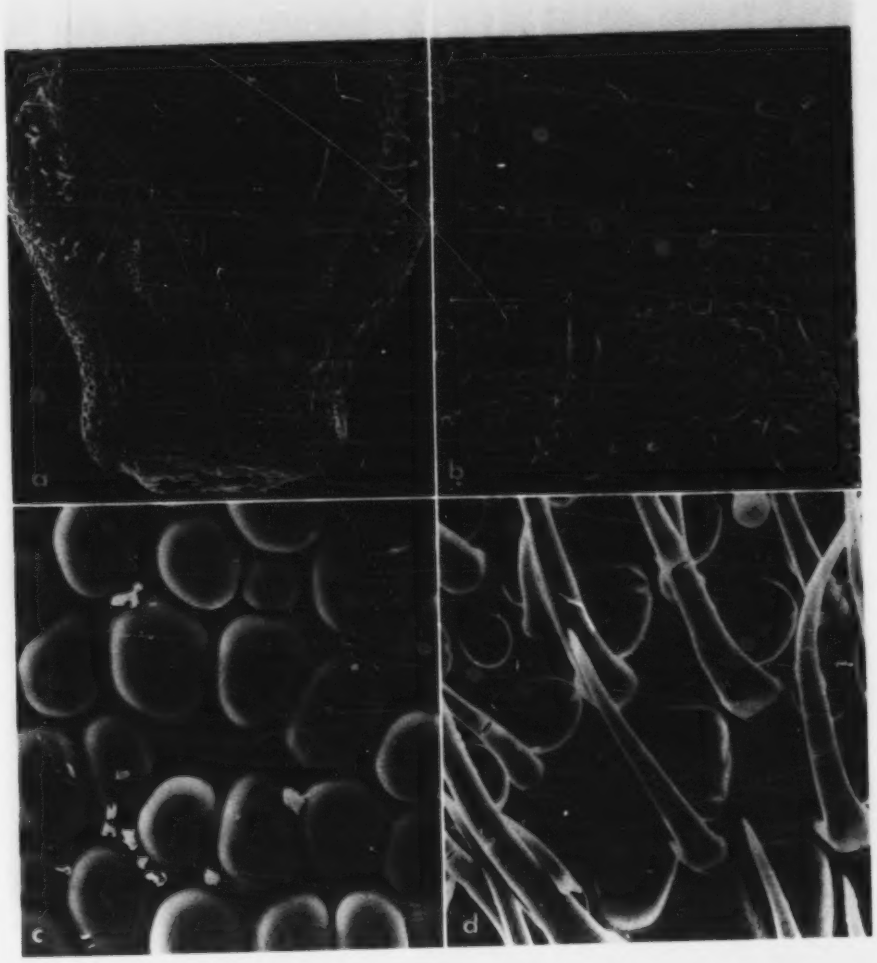


FIGURE 21.—Detail of female anthecium, *Olyra longifolia*: *a*, base of the anthecium, ventral side (× 70); *b*, detail of the papillae at the base of the anthecium (× 200); *c*, papillae (× 1000); *d*, apex of the palea showing rounded excavations and unicellular macrohairs (× 500). Micrographs *a–c* of *Black 48-2447* (US), *d* of *Schultes & Cabrera 15386* (US). (Reduced to 77% of indicated magnifications for publication.)

spikelets thickened; *axis* of the branches scabrous to sparsely pubescent. *Female spikelets* lanceolate, aristate, 17–22 mm long, 2.4–3 mm wide, greenish to purplish, the glumes subequal, scabrous, anthecium 1/2 or less the length of the spikelet; *lower glume* short-aristate, 7–13-nerved with transverse veinlets, acuminate, glabrous, scabrous toward the apex of the inner surface; *upper glume* 15–18 mm long, 7–13-nerved with transverse veinlets, acuminate, glabrous; *anthecium* obovoid, 5.2–6.6 mm long, 1.9–2.4 mm wide, narrowed basally, acute apically, pale, with rounded to irregular excavations spaced throughout the surface and thickened, caducous, fragile and unicellular hairs toward the apex; *lemma* 7-nerved, *palea* 4-nerved. *Caryopsis* obovoid, brownish, 3.8–4.2 mm long, 2 mm wide; hilum as long as the caryopsis; embryo 1/6 the length of the caryopsis. *Male spikelets* lanceolate, short-aristate, 5.3–7.3 mm long, 0.6–0.8 mm wide, scabrous, pale to purplish; *lemma* 3-nerved, short-aristate; *palea* 2-nerved; anthers 3, 2–3 mm long.

DISTRIBUTION.—Northern South America from Colombia to Bolivia and Brazil, from sea level to 400 m elevation; especially common in the Guianas (Figure 23).

ADDITIONAL SPECIMENS SEEN.— BOLIVIA, BENI: 2 km NW of Guayamerín, *Anderson et al. 12119* (MO, US).

BRAZIL, AMAPÁ: Araguari River, *Pires et al. 50581* (NY); Oiapoque, *Fróes 25743* (IAN). AMAZONAS: Cahoeira Caranguejo, River Cuabury, *Holt and Blake 422* (US); Cucuhy, Rio Negro, *Holt and Gehriger 356* (NY, RB, US), *399* (US); near Tunui, Içana River, *Fróes 28411* (IAN); Barcelos, *Maguire et al. 60041* (US); Rio Negro, ~120 km above Barcelos, *Madison et al. 6181* (US); between Moreira and Rio Quinini, *Prance et*

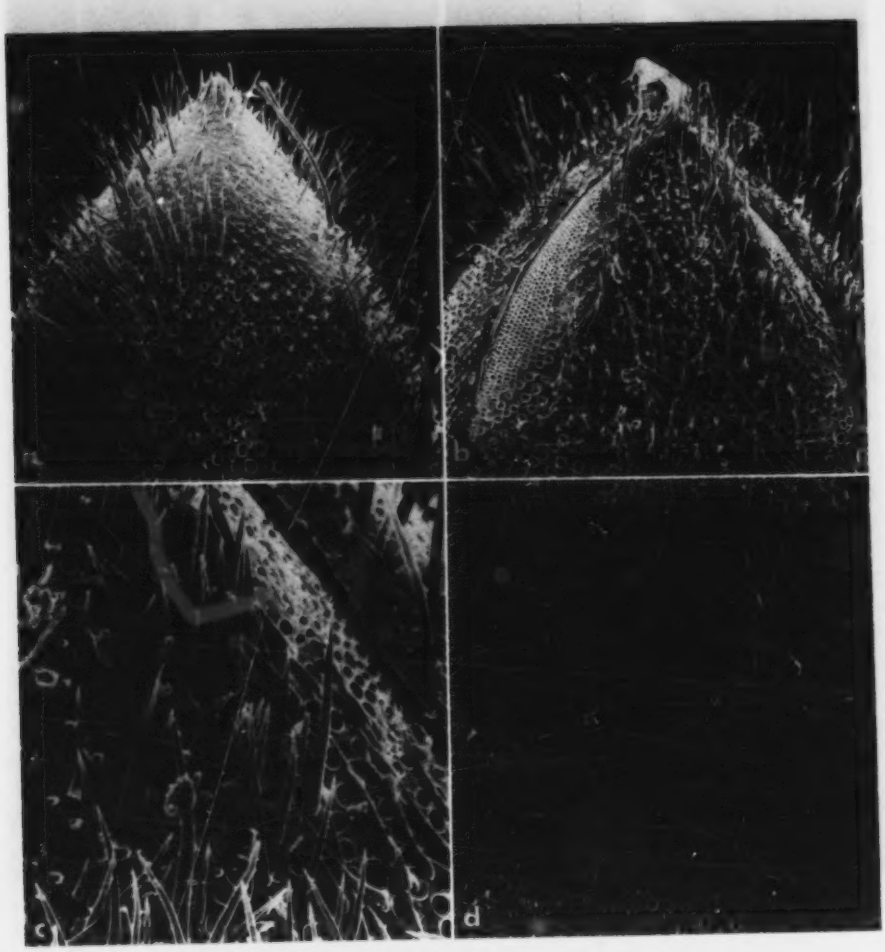


FIGURE 22.—Detail of female anthecium, *Olyra longifolia*: *a*, apex of the anthecium, dorsal side (× 50); *b*, apex of the anthecium, ventral side (× 50); *c*, detail of the palea (× 200); *d*, anthecium, ventral side (× 50). Micrographs *a–c* of *Steyermark 512431* (US), *d* of *Schultes & Cabrerra 15386* (US). (Reduced to 77% of indicated magnifications for publication.)

al. 16253 (F); Camundé, Rio Negro, *Baldwin 3396* (US); Negro River, Ilha do Piranade, above Barcelos, *Baldwin 3297* (RB, US); Negro River, Ilha do Matupiri, *Fróes 28261* (US); Paraná de São José de Ariraha, *Baldwin 3298* (US); Parawa, below São Felipe, Rio Negro, *Baldwin 3572* (US); Tapuruquara, Rio Negro, *Black 48-2477* (US), *Pires 274* (NY); Rio Negro, between Moreira and Rio Quinini, *Prance et al. 16253* (US); Rio Negro, between Ilha Jacari and Airão, *Prance et al. 15098* (US); basin of Rio Demeni, vicinity of Tototobi, *Prance et al. 10217* (US); região do Rio Jari, Estrada do Munguba, *Silva 1642* (US). MARANHÃO: Pindaré River, Monção, *Fróes 20328* (US). PARÁ: Belém, *Soderstrom 1193* (US); Bon Jardim-Itaituba, *Swallen 6943* (US); Bragança railroad, *Goeldi 79* (RB, US); Ilha do Rocado, 4 km NW de Cachoeira Porteira, *Martinelli 7130* (MO); Mojú River, Estate Conceição, *Goeldi 150, 151½* (US); Mojú Fabrica, *Kuhlmann 2128* (R, RB, US), *Black 54-16211* (US), *54-16319* (IPEAN); Gurupá, Igarapé Jacupí, *Pires and Silva 4690* (US); River Cuminá, Cuminámiri, *Silva 1265* (US); 1 km N of Fazenda Urucurituba, on Tapajós River, *Archer 8397* (US); Paragominas, River Uraim, *Silva 404* (US); Piratininga, Almeirim, *Ducke s.n.*, April 16, 1923 (RB, US); Serubin, Itacaiuna River, *Fróes and Black 24540* (US). RORAIMA: Baixo Rio Branco, *Fróes 23011* (NY, US); Posto Mucajaí, Rio Mucajaí, *Prance et al. 11074* (US).

COLOMBIA, BOYACÁ: Orocué, *Haught 2821* (F, NY, US). CHOCÓ: Quebrada La Sierpe, *Forero et al. 3915* (MO). EL VALLE: Veneral, Yurumangui River, *Cuatrecasas 15873* (F, US); Quebrada del Corosal, Cajambre River, *Cuatrecasas 17751* (F, US). VAUPÉS: Cachivera de Jirijirimo, Apaporis River, *Schultes and Cabrera 12424* (US); between the rivers

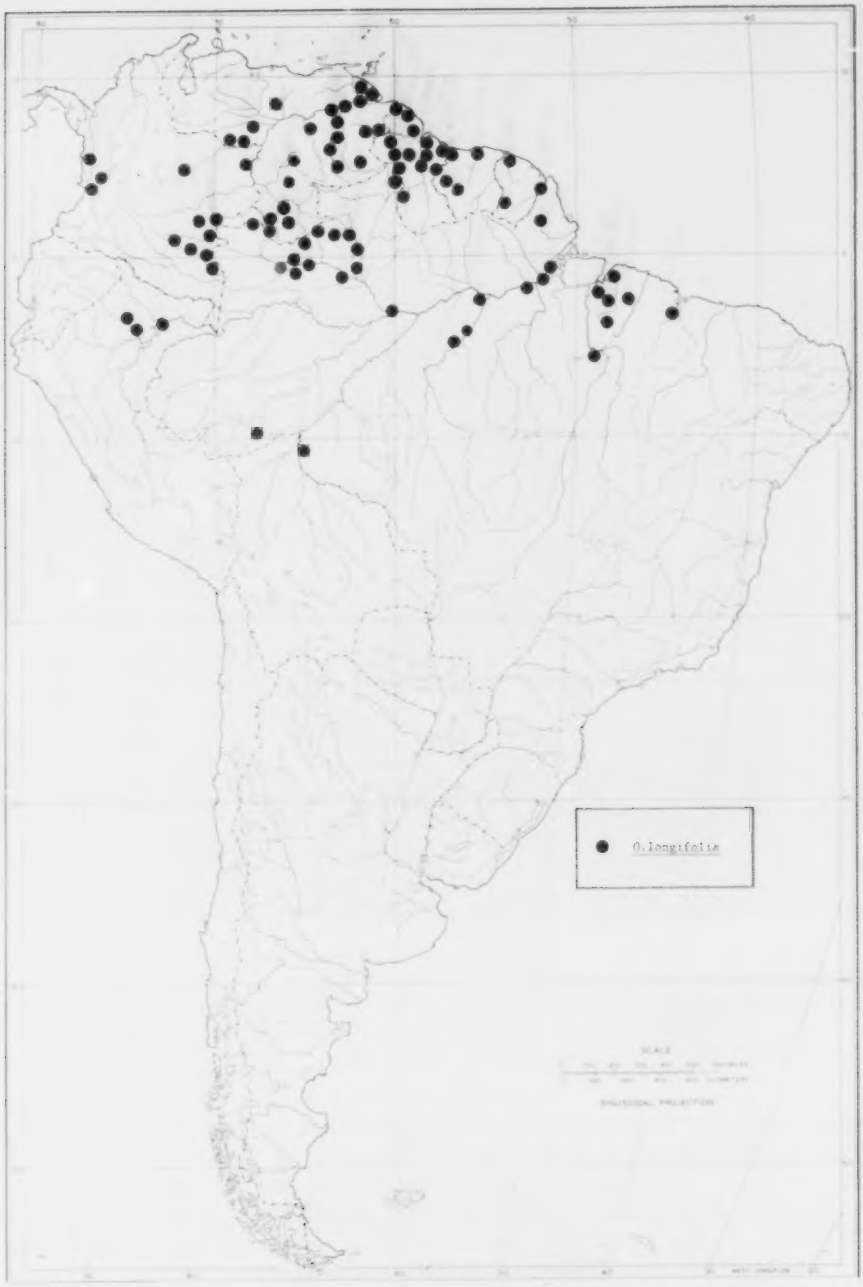


FIGURE 23.—Distribution of *Olyra longifolia*.

Pacoa and Kananari, Apaporis River, *Schultes and Cabrera 13817* (US); Raudal Yayacopi and vicinity, *Schultes and Cabrera 15386* (US); Inirida River, San Joaquín, *Fernandez 1999* (F, US); Mitú, *Arbeláez and Cuatrecasas 6784* (US); Pacoa River, tributary of Río Apaporis, *Schultes and Cabrera 15259* (US); selvas del Tui-Igarapé, *Cuatrecasas 6869* (US).

FRENCH GUIANA: Acarouany, *Melinon 231* (US, WIS); Haut Itany, *Hoock s.n.*, 1 Jan 1956 (P); Itany, Tolinga, *Hoock s.n.*, 30 Dec 1955 (P).

GUYANA: Akwero, *Maas 2409* (US); Bonisika Landing,

Arawau River, *Archer 2336* (US); Bunsika Ck., Aruwau Ck., without collector, March 28, 1945 (NY); Cuyuni River, *Tutin 970* (US); Essequibo River, near mouth of Mazaruni River, vicinity of Penal Settlement, *Hitchcock 17241* (US); SE of Georgetown, East Coast Water Conservancy, *Hitchcock 16979* (US); vicinity of Issorora, on Aruka River, *Hitchcock 17577* (US); Kamakusa, *Leng 16* (NY); Kaieteur Fall, left bank of Potaro River, *Cowan and Soderstrom 2001* (F, US); 3 mi [5 km] above Kaieteur Fall, *Cowan and Soderstrom 2108* (US); Kanuku Mountains, in drainage of Moku-moku Creek, *A.C. Smith 3410* (F, MO, NY, US); Mazaruni Station, *Tutin 138* (RB, US); Moruka River, Santa Rosa, *De la Cruz 998* (NY, US); Pomeroon River, *De la Cruz 3167* (F, MO, NY, US); Potaro River, *Jenman 7528* (US), *Sandwith 1395* (US); Rockstone, on the Essequibo River, *Hitchcock 17332* (NY, US); vicinity of Tumatumari on Potaro River, *Hitchcock 17363* (F, MO, NY, US); Wismar, on the Demerara River, *Hitchcock 17423* (US); banks of Yawakuni River, *Abraham 189* (US); without locality, *Jenman 5963* (NY, US), *6737* (US).

PERU, LORETO: Río Nanay, lowland forest near River at Shiriara, *Plowman 2554* (US); Timbuchi, on the Río Nanay, *Williams 1043* (F, US).

SURINAM: Kayser airstrip, 25 km above confluence with Lucie Rivier, *Maguire et al. 53952* (US); Kayser airstrip on the Zuid-Rivier, *Kramer and Hekking 2978* (NY); Nickerie River, Kamisa falls, *Maas 1966* (US); Wayombo River, near the mouth, *Lindeman 6322* (US); N of Nickerie River, *Lanjouw and Lindeman 3404* (NY); without locality, *Hostmann 97* (US).

VENEZUELA, AMAZONAS: Along Orinoco River, at mouth of Río Sanariapo, below Sanariapo, *Steyermark 58431* (F, US); Cunucunuma River, along river 0.5 mi [1 km] above Culebra Rapids, *Maguire et al. 30393* (NY, US); near Santa Barbara del Orinoco, *Steyermark 117163a* (MO); vicinity of Río Coro-Coro, near airport of Yutaje, *Liesner et al. 10980* (MO); 5 km S of San Carlos de Río Negro, *Liesner 6205* (MO); W side of Isla Sebastián, Río Casiquiare, above Chapezon, *Liesner and Clark 8890* (MO); Caño Jotajana, tributary of Caño Guiniquina, *Steyermark 115125* (MO); Ibaruma, *Tamayo 3617* (F, MO); upstream from San Victor, past Quebrada Piedradero and Río Matanaima, *Steyermark 87188* (NY); between La Margarita and Puerta Miranda, Acure River, *Steyermark 87721* (US); 5–14 km ESE of Los Castillos de Guayana, *Davidse and Gonzalez 16275* (MO). APURE: 4.5 airline mi [7 km] ESE of San Carlos del Meta along the banks of the Río Meta, *Davidse and Gonzalez 13828* (MO); E of the southern tip of the Galeras de Cinaruco, *Davidse and Gonzalez 14616* (MO), *15640* (MO, US); near the Río Meta at Fundo El Algarrobo, Morichal de la Madera, *Davidse and Gonzalez 14200* (MO). BOLÍVAR: Rainforest along Río Apacará, Apacará-tepuí, *Steyermark 74642* (F, NY, US); Sierra Imataca, Río Toro, between Río La Reforma and Puerto Rico, *Steyermark 87837* (NY); Ichún River, below the Salto Mariá Espuma, *Steyermark 90463* (NY, US); near Campamento Las Pavas, *Steyermark 117199* (MO); Paragua River, between La Paragua and Salto de Auraima, *Killip 3 7317* (US); Torono River, Indian camp above junction with Paragua River, *Killip 37424* (US); vicinity of Los Patos, *Steyermark 86996* (US); Guaiquinima, dense forest east of River Paragua toward Cerro Guaiquinima, *Killip 37481* (US); SE of Canaima, *Steyermark 106401* (MO). DELTA AMACURO: Caño Jotajana, between Epaña and Caño Araguabisi, *Steyermark et al. 115125* (WIS). GUÁRICO: Parmana, *Tamayo 4030* (F, MO, US).

DISCUSSION.—This is a variable species, with great variation in the size of plants and panicles.

Olyra longifolia is characterized by having the female and male spikelets in conjugate branches of the same panicle, these being contracted and borne on the uppermost nodes of the culms. In this character the species parallels the inflorescence structure of the olyroid Cuban herbaceous bamboo genera *Ekmanochloa* Hitchcock and *Mniochloa* Chase. The obovoid anthecium is greatly reduced in relation to the size of the spikelet and has rounded excavations and long, stiff, caducous hairs over the entire surface (more so toward the apex). Flowering occurs from December to June.

Clayton and Renvoize (1986) cite this species as a link between *Olyra* and *Cryptochloa* but it should be pointed out that there is no stipe at the base of the female anthecium as in the latter genus. *Cryptochloa* also differs in its usual arrangement of female racemose inflorescences from the lower nodes and female paniculate inflorescences from upper nodes of the culms.

The common name is recorded as "taboquinha" in Brazil.

15. *Olyra loretensis* Mez

FIGURES 15, 24, 25

Olyra loretensis Mez, 1917:47. [Type: "Peruvia, Dept. Loreto, prope Leticia in silvis (*Ule n. 6224*)." Holotype, B, fragment of the holotype, US sheet no. 2877942.]

Cespitose perennials from creeping rootstocks and forming dense clumps. *Culms* 30–60 cm tall, geniculate-ascending, cylindrical, hollow, short-pubescent, biform: *leafy culms* bearing leaves only, with the leaves of the basal nodes consisting of a sheath only or with a rudimentary blade, the sheaths shorter than the internodes; nodes thickened, formed of the thickened basal rim of the sheath above and the thickened upper rim of the internode below, brownish, short-pubescent with retrorse hairs. *Leaves* 5–15 per complement; sheaths sparsely papillose-pilose with short and caducous, appressed hairs, the margins ciliate, more so toward the upper part; ligule membranous-ciliate, small, 0.5 mm long; pseudopetiole stramineous, 0.2–0.3 cm long, covered by long whitish hairs; blades ovate-lanceolate to lanceolate, 11–15 cm long, 3.5–5.8 cm wide, acuminate, asymmetric and truncate basally, the midnerve conspicuous toward the base, transverse veinlets present, the adaxial surface glabrous, the abaxial one pilose toward the base, the basal margins shortly ciliate, otherwise

FIGURE 24.—*Olyra loretensis*: *a*, habit (× 0.5); *b*, portion of a branch (× 3.2); *c*, male spikelet, side view (× 13.5); *d*, ligule and pseudopetiole (× 3.2); *e*, lower glume, inner side (× 3.2); *f*, upper glume, inner side (× 3.2); *g*, anthecium, dorsal side (× 6.5); *h*, anthecium, ventral side (× 6.5). Component *a*, a composite: base from *Fróes 31193* (IAN), inflorescence from *L. Williams 3001* (US); habit and inflorescence from *Cowan and Maguire 38104* (US). Components *b,d,e-h* based on *Cowan and Maguire 38104* (US); *c* on *Pires and Black 845* (US). Illustration by G.B. Threlkeld.

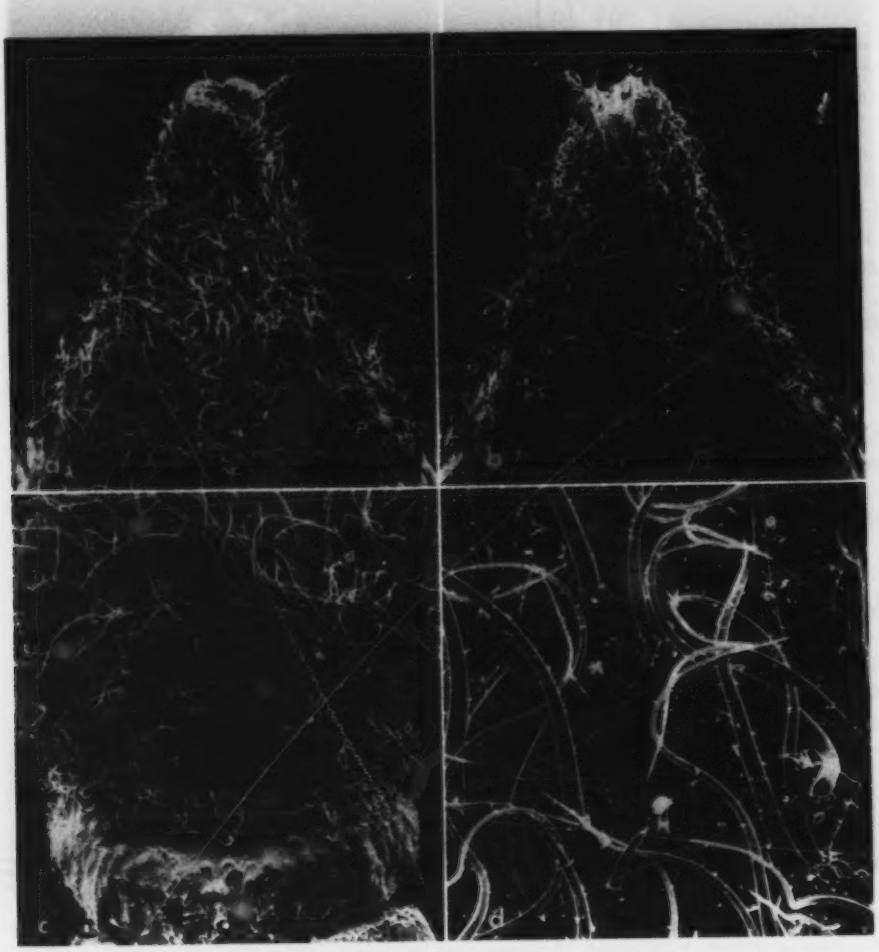


FIGURE 25.—Detail of female anthecium, *Olyra loretensis*: *a*, apex of the anthecium, dorsal side (× 50); *b*, apex of the anthecium, ventral side (× 50); *c*, base of the anthecium, dorsal side (× 50); *d*, detail of the surface of the lemma with cylindrical macrohairs (× 200). All micrographs are of *Grassl 10089* (US). (Reduced to 77% of indicated magnifications for publication.)

scabrous. *Non-leafy culms* with leaf sheaths only; *sheaths* stramineous to purplish, wide, strongly ribbed and overlapping, sparsely pilose. *Inflorescences* paniculiform, terminal, long-to short-exserted, the young panicles included in the upper sheaths, these pyramidal, lax, 6–12 cm long, 5–14 cm wide, the lower branches whorled and with male spikelets only, the upper ones alternate to opposite, with numerous and spaced male spikelets in long tertiary branchlets, the female spikelets terminal and solitary in each culm; *axis* and branches longitudinally ridged, scabrous to glabrous, the axils of the branches pilose, brownish. *Female spikelets* lanceolate, aristate, 13–18 mm long, 2.5–3 mm wide, whitish, the glumes subequal, longer than the anthecium, scabrous to sparsely pilose toward the apex, otherwise completely glabrous, tipped by purple awns; *lower glume* 5–9-nerved with manifest transverse veinlets, long-aristate, the awn of 6–8 mm long; *upper glume* 5–9-nerved with transverse veinlets, aristate, awn of 4–6 mm long; *anthecium* long-ellipsoid, narrowed at the base, short-stipitate, 7.8–8.1 mm long, 2.1–2.5 mm wide, acuminate apically, whitish, pilose with long, appressed and cylindrical macrohairs over the entire surface; *lemma* 3-nerved, *palea* 2-nerved. *Caryopsis* fusiform, brownish, 4.5 mm long, 2.2 mm wide; hilum linear, as long as the caryopsis. *Male spikelets* lanceolate, 2.5–3.3 mm long, 0.5–0.7 mm wide, 1/5 the length of the female spikelets, scabrous to scaberulous; *lemma* 3-nerved, aristulate; *palea* 2.2–2.6 mm long, 2-nerved.

DISTRIBUTION.—This is an Amazonian species that grows in the dense forests of equatorial Brazil, Colombia, and Peru (Figure 15), at elevations from 0 to 400 m.

ADDITIONAL SPECIMENS SEEN.—BRAZIL. AMAPÁ: Serra

do Navio, *Emmerich and Andrade 712* (R, US), Serra do Navio, Curuca Ore Body, *Cowan and Maguire 38104* (NY, RB, US). AMAZONAS: Esperança, *Pires and Black 845* (IAN, US), *Krukoff 7502, 7512, 7517* (NY); Estrada Humaitá-Labrea, *Vieira et al. 53* (MO); São Francisco, Rio Purús, *Kuhlmann 913* (IAN, RB, US); road Humaitá to Pôrto Velho, km 10, *Prance et al. 3446* (F, MO, US); Rio Solimões, *Fróes 24058* (IAN); Solimões river, Barrio de Odorio, São Paulo de Olivença, *Lleras et al. P17389* (US); Manaus-Pôrto Velho Highway, km 380, 2 km S of Rio Jutaí, *Prance et al. 22865* (US); Rio Purús, between Lago Quati and Lago Arima near Rio Jacaré, *Prance et al 13427* (US); km 620 on Manaus-Humaitá road, *Lowrie et al. 73* (MO); Rio Javari, non-inundated disturbed forest behind village of Paumari, *Gentry and Revilla 20559* (MO). PARÁ: Santarém, Estrada para o rio Curuá-Una, acampamento do Juarana, *Cavalcante and Jouc 1470* (US); Taperinha, parana do Ituqui, *Fróes 31193* (IAN). RONDÔNIA: 8 km NE of Pôrto Velho, *Prance et al. 8246* (MO, US).

COLOMBIA, AMAZONAS: Río Amaca-Yacu, 20 km de son embouchure sur l'Amazone, *Sastre and Echeverry 612* (US); Leticia, *Black and Schultes 46-1* (IAN, US); 18 km N of Leticia, *Gillett 16471* (MO); Loretoyacu River, 3°46′S, 70°23′ N, *Grassl 10089* (US).

PERU, JUNÍN: Puerto Bermudez, *Killip and Smith 26568* (US). LORETO: San Fernando, frontier military post on Río Jauari, above Santa Rita, *Gentry and Revilla 20914* (F, MO); La Victoria, *Williams 3001* (F, US).

DISCUSSION.—Flowering occurs between August and February. *Olyra loretensis* is unique in the genus in possessing inflorescences borne on specialized reduced-leafy culms which completely lack blades. It is a handsome species, in which the white color of the body of the female glumes contrasts strikingly with the purple color of the panicle branches, female spikelet pedicels, female glume awns, and male spikelets.

Gould and Soderstrom (1970) have recorded a chromosome number of 2n = 22.

16. *Olyra maranonensis* Swallen

FIGURE 15

Olyra maranonensis Swallen, 1966:86. [Type: "Type in the U.S. National Herbarium No. 2382316, collected in rainforest on ridge crest of Quebrada Chuivi, valley of Río Marañón near Cascades de Mayasí, elevation 500–550 m., Amazonas, Peru, September 20, 1962, by *John J. Wurdack* (No. *1936*)." Holotype, US sheet no. 2382316.]

Cespitose perennials. *Culms* erect, ~1 m tall, unbranched; internodes cylindrical, hollow, glabrous, stramineous to purplish; nodes thickened, purplish, glabrous. *Leaves* with sheaths pale to greenish, mottled with dark spots, the margins ciliate to glabrous, the rest of the surface shortly pubescent to glabrous; ligule membranous-ciliate, ~0.5 mm long; pseudopetiole ~0.3 cm long, dark, scaberulous on both surfaces; blades lanceolate, flat, 18–23 cm long, 3.6–4 cm long, narrowing from an asymmetric base to an acuminate, symmetric tip, ascending, glabrous, the margins scaberulous, the midnerve conspicuous toward the base on the adaxial surface. *Inflorescences* paniculiform; panicles terminal, lax and pyramidal, 13 cm long, 4 cm wide, the lower branches whorled, the upper whorled to alternate, spreading, the lower branches naked at the base and with male spikelets only, the upper branches with male spikelets arranged in tertiary branchlets below and one terminal female spikelet in each branch or the female spikelets borne solitary from the axis in the upper portion; *axis* longitudinally ridged, scaberulous, purplish, the branches triquetrous, scabrous, the axils of the branches glabrous; pedicels of the female spikelets thickened, scaberulous to glabrous. *Female spikelets* fusiform, aristate, 11–25 mm long, 2.5–2.7 mm wide, glabrous, whitish; *lower glume* 11–25 mm long, aristate, 5-nerved with transverse veinlets, glabrous on the inner surface, short-scabrous toward the apex and margins of the outer surface, the awn of ~10 mm long; *upper glume* acuminate, 10–13 mm long, 7-nerved with transverse veinlets, glabrous on the inner surface, short-scabrous toward the apex of the outer surface; *anthecium* ellipsoid, acute, 7.5 mm long, 2.7 mm wide, smooth and shining, whitish to stramineous, with long, flattened macrohairs toward the apex and base of the lemma on the ventral surface, the margins of the lemma with prickle hairs, dorsal surface glabrous. *Caryopsis* not seen. *Male spikelets* fusiform, short-aristate, 3.5–4.7 mm long, 0.6–0.7 mm wide, hispid; *lemma* 3-nerved; *palea* 2.8–4 mm long, 2-nerved.

DISTRIBUTION.—Known only from the type locality in northern Peru (Figure 15).

DISCUSSION.—*Olyra maranonensis* resembles *O. glaberrima*, differing from it by the smaller, hispid male spikelets and scaberulous pseudopetioles.

17. *Olyra micrantha* Humboldt, Bonpland & Kunth

FIGURES 17*d*, *f*, 26–28

Olyra micrantha Humboldt, Bonpland & Kunth, 1816:199. [Type: "Crescit in umbrosis, humidis ad ripam Orinoci prope cataractam Maypurensium." Holotype, P, not seen, fragment of the holotype, US sheet no. 2877940.]

Olyra hirsuta Trinius, 1826:250. [Type: "Brasil. (Langsdorff)." Holotype, LE, not seen.]

Olyra scorbiculata Schrader ex Nees von Esenbeck, 1829:303. [Nomen nudum.]

Olyra ventricosa Nees von Esenbeck, 1829:303. [Type: "Var. *alpha* in Mont. Corcovado, haud procul a Río de Janeiro urbe. (Mart. Langsdorff).—Var. *beta* in paludibus ad Paraiba. (Seren. *Princ. Maximil. Neovid.*, nec non in ripa lacas Canomensis, in sylvaticis, et alibi in pro. Paraensi, juxta fluv. Amazonum (*Mart.*).— Vidi in Herb. Regio Berol. a *Sellowio* lectam).—Var. *gamma* in sylvis aboriginibus ad Sebastianopolin aliisque in locis prov. Rio de Janeiro. Floret Martio–Majo, et Novembr." Holotype, B, not seen.]

Olyra urvillei Steudel, 1853:36. [Type: "ex Hrbo. *Urville*." Holotype, P, not seen.]

Olyra micrantha var. *decalvata* Doell in Martius, 1877:324. [Type: "prope Manaos prov. do Alto Amazonas (*Spruce*)." Holotype, B, not seen.]

Olyra micrantha var. *lanceolata* Doell in Martius, 1877:324. [Type: "prope Rio de Janeiro (*Gaudichaud n. 297*)." Holotype, P, not seen, fragment of the

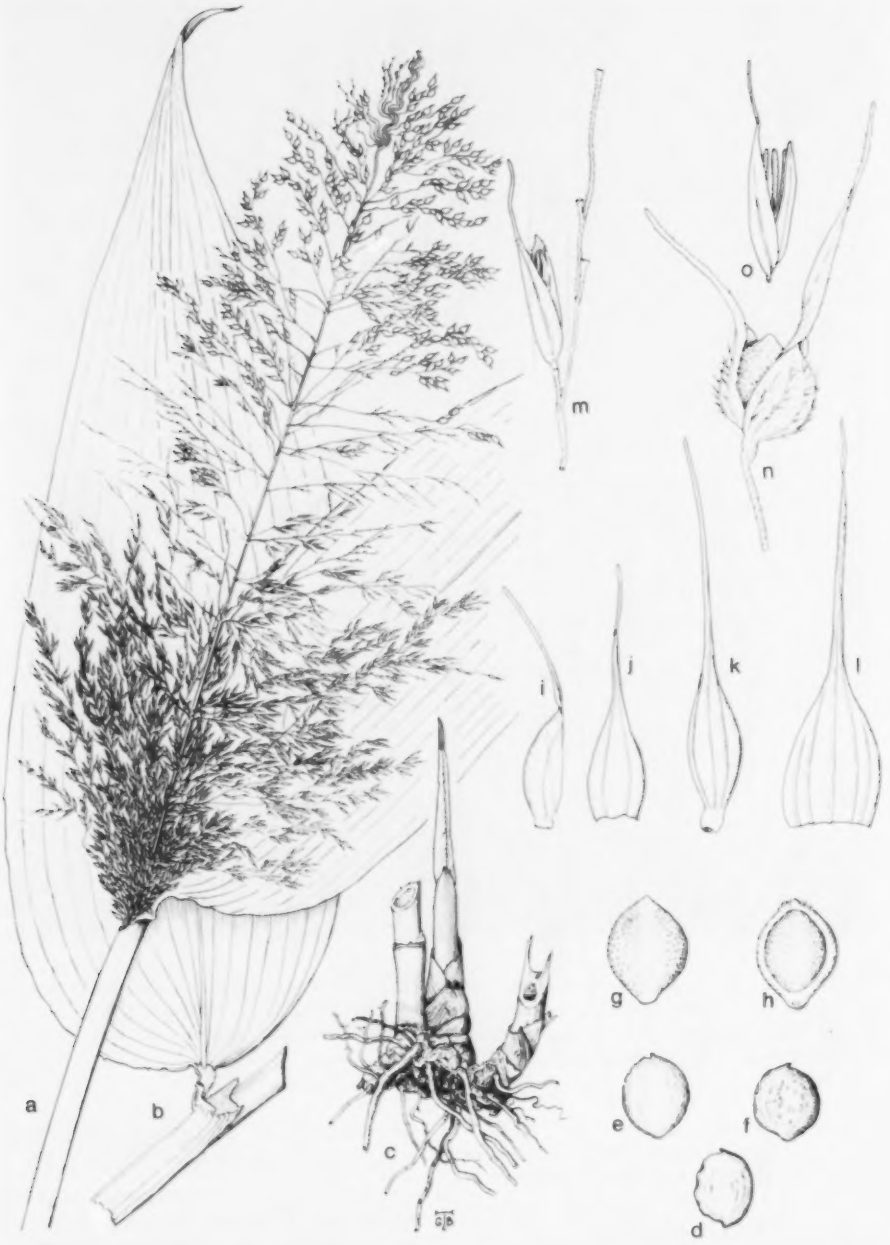


FIGURE 26.—*Olyra micrantha*: *a*, inflorescence (× 0.5); *b*, leaf blade (× 0.5); *c*, base of the plant (× 0.5); *d-f*, caryopsis side view (× 6); *g*, female anthecium, dorsal side (× 6); *h*, female anthecium, ventral side (× 6); *i*, lemma of the male spikelet, side view (× 6); *j*, palea of the male spikelet, inner view (× 6); *k*, lower glume of the female spikelet (× 6); *l*, upper glume of the female spikelet (× 6); *m*, portion of a branch of the inflorescence with a male spikelet (× 6); *n*, female spikelet (× 6); *o*, male spikelet (× 6). Components *a* and *b* based on *Irwin et al. 54892* (US), *c* on *Altson 496* (US), and *d–o* on *Belém 1814* (US). Illustration by G.B. Threlkeld.

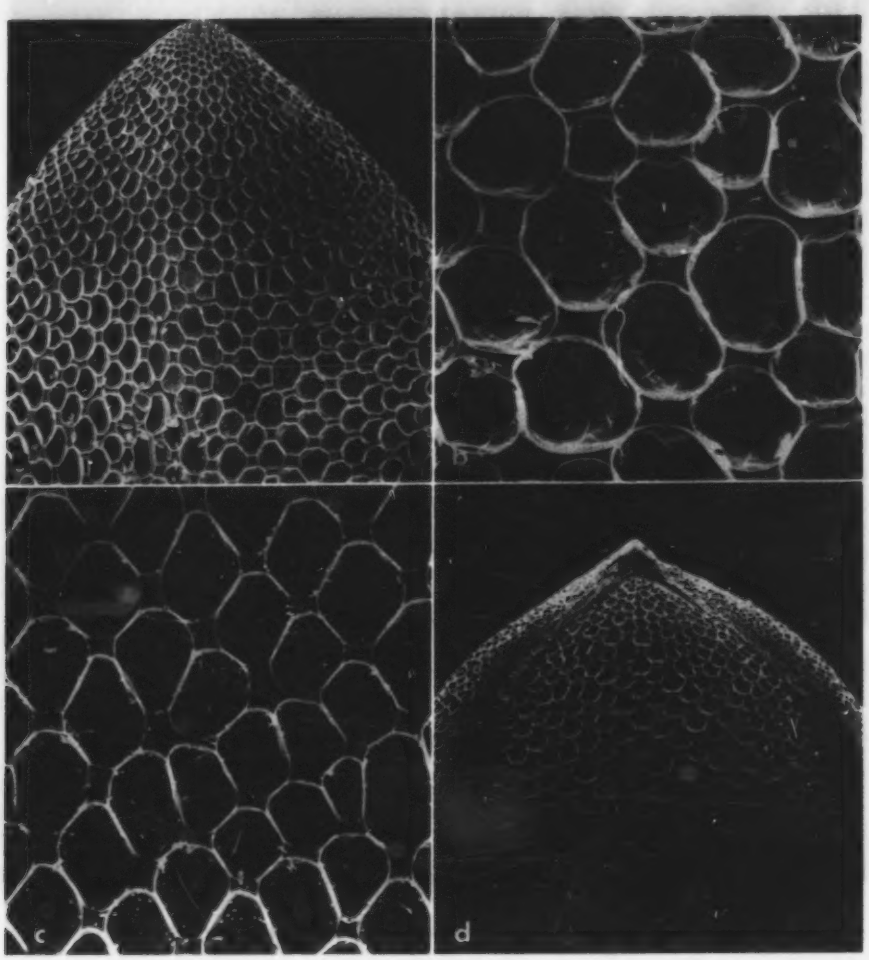


FIGURE 27.—Detail of female anthecium, *Olyra micrantha*: *a*, apex of the anthecium, dorsal side (× 50); *b*, detail of the surface of the lemma with rounded excavations (× 200); *c*, detail of the surface of the palea (× 200); *d*, anthecium, ventral side (× 50). Micrographs *a,b* of *Chase 10186* (US), *c,d* of *Anderson 867* (US). (Reduced to 77% of indicated magnifications for publication.)

holotype, US sheet no. 2877940.]

Olyra micrantha var. *subvelutina* Doell in Martius, 1877:324. [Type: "prope Rio de Janeiro (Riedel, sub nomine Olyrae pubescentis)." Holotype not located.]

Olyra d'Urvillei Doell in Martius, 1877:323. [Nomen nudum.]

Cespitose perennials in dense clumps of as many as 20 culms borne close together from a short, creeping rhizomatous base. *Culms* erect, 1–4 m tall, climbing and leaning on the vegetation, densely branching at the upper nodes; internodes cylindrical, hollow, glabrous; nodes compressed, dark, shortly pubescent to glabrous. *Leaves* with sheaths stramineous, densely pubescent with long and appressed to erect hairs; ligule membranous-ciliate, conspicuous, 2.4–15 mm long, glabrous on the adaxial surface, sparsely pubescent on the abaxial one; pseudopetiole 0.4–1.2 cm long, pale to purplish, shortly pilose; blades oblong-lanceolate, 13–32 (–55) cm long, 2.4–11.5 (–13) cm wide, acuminate apically, the base symmetric and subcordate, the adaxial surface greenish, glabrous to occasionally hispid to scabrous, the abaxial surface glaucous, glabrous to hispid, the midnerve prominent, the margins shortly ciliate. *Inflorescences* paniculiform, borne from the uppermost nodes; panicles lax and diffuse, pyramidal, 10–32 cm long, 4–14 cm wide, the branches spreading, the lower ones whorled and bearing male spikelets only, the upper ones alternate with male spikelets below and terminal female spikelets; *axis* longitudinally ridged, hispid, the branches angled, hispid; pedicels of the female spikelets thin, not thickened, similar to the ones of the male spikelets, scabrous to hispid. *Female spikelets*

FIGURE 28.—Distribution of *Olyra micrantha*.

disarticulating below the glumes, ovoid, aristate, 5.4–12.8 mm long, 1.8–2.6 mm wide, hispid to scabrous, the glumes separated by an internode, falling with the anthecium, unequal, papillose-pilose with long to short hairs on the outer surface to scabrous, the inner surface of the glumes densely hispid, lower and upper glume; *lower glume* aristate, 5-nerved; *upper glume* aristate to subulate apically, 3.7–9.2 mm long, 3–5-nerved; *anthecium* ovoid, acute, 2.8–3.5 mm long, 1.3–2.1 mm wide, minutely scabrous toward the apex of the lemma to completely glabrous, brownish, pitted, with rounded

excavations over the entire surface; *lemma* 5-nerved. *Male spikelets* fusiform, aristate, 7.4–9.3 mm long, 0.8–1.1 mm wide; *lemma* long-aristate, scabrous, sparsely pilose; *palea* 4.6–7.1 mm long, 2-nerved, scabrous; anthers 3, 3.7 mm long.

DISTRIBUTION.—Widely distributed in South America, from Colombia and Venezuela eastward to the Atlantic Coast and westward to the Andes (Figure 25), at elevations mostly below 500 m; the southwestern boundary of its range apparently is determined by rainfall, with this species occurring in the wetter areas of Peru, Bolivia, Argentina, and Paraguay. There is also a nineteenth century collection from the Fiji Islands that must represent a casual introduction.

ADDITIONAL SPECIMENS SEEN.—ARGENTINA. MISIONES: San Pedro, S of Tobuna, *Renvoize et al. 3232* (US).

BOLIVIA. BENI: Chácobo village of Alto Ivon, *Boom 4091* (US). LA PAZ: San Carlos, *Buchtien 38, 39, 65, 77, 78, 1158* (US), *76* (NY). PANDO: Río Arroyo, *Sperling and King 6554* (US). SANTA CRUZ: Río Vibora, *Steinbach 7572* (NY).

BRAZIL. ACRE: Vicinity Sena Madureira, *Cid and Nelson 2541a* (MO). AMAPÁ: Rio Jari, base of Serra da Arumanduba, *Egler and Irwin 45967* (NY, US). AMAZONAS: Near Manaus, *Spruce 1533* (NY, US); Manaus, estrada do igarapé do Tabatinga, *Rodriguez and Chagas 2823* (US); Manaus, estrada antiga de S. Raimundo, *Chagas and Coelho 3773* (US). BAHIA: Fazenda Barra do Manguinho, *Mattos Silva et al. 1067* (CEPEC); São Bento dos Lages, *Lutzelburg 137* (NY); Castelo Novo, *Velloso 1099* (US); Jaguaquara, *Pinto 619* (US); Maraú, *Belém 1814* (CEPEC, US); Rodovía BR 5, 16 km S of Eunápolis, *Belém and Pinheiro 2675* (CEPEC, US); Rodovía Camaçan-Canavieira, 3–30 km de Camaçan, *Belém et al. 1392* (CEPEC, US); Santa Cruz do Cabrália, *Eupunino 280* (CEPEC, US); Dunas de Itapué, *Noblick 1625* (CEPEC); Belmonte, *Santos 1128* (CEPEC, US); estrada Uruçuca-Serra Grande, *Gomes 101* (RB); Rodovía Belmonte-Itapebí, km 26, *Mattos Silva and Hage 590* (CEPEC); Rodovía Maraú-Ubaitaba, km 3, *Calderón 2036* (US); Riveirão de Fora, 4 km S of Itamarajú city on road Itamarajú-Teixeira de Freitas, *Calderón and Pinheiro 2213* (CEPEC, US); Serrinha, *Capanema s.n.* (US 950601). CEARÁ: Baturité to Guaramirango, *Swallen 4417* (US). ESPÍRITO SANTO: Est. Pedro Palacios, Boa Vista, *Vieira 52* (RB); between Barra de Santa Angelica and Burarama, *Soderstrom and Sucre 1971* (US); Reserva Biológica de Sooretama, Mata do Cupido, *Soderstrom and Sucre 1899* (CEPEC, US); road from Cachoeiro de Itapemirim to Itabira, *Soderstrom and Sucre 1966* (US); Serra do Caparão, *Chase 10111* (US); SW of Vitória, *Soderstrom and Sucre 1875* (CEPEC, US). MARANHÃO: Rio Pindaré, Monção, *Fróes 20306* (US). MATTO GROSSO: Entre Cururú y Vilhena, *Kuhlmann 1867* (RB); margem esquerda do Río Juruena, *Rosa and Santos 213 9* (RB). MINAS GERAES: Juiz de Fora, *Schwacke s.n.*, 1895 (RB); without locality, *Lindberg 512* (US); Caldas, *Regnell III-1377* (P, US); Lavras, *Black 394b* (US); Viçosa, *Chase 10186* (US), *Mexia 5089* (US, WIS), *5139a* (P, US), *5113* (NY, P, US, WIS), *5153* (NY, WIS); road to Barroso, about km 6, *Mexia 5183a* (US, WIS). PARÁ: Thomé Assú, Agua Branca, *Mexia 5952* (NY, US); S slope of Akarai Mountains, in drainage of Rio Mapuera, *A. Smith 2934* (NY, US); Boa Vista on the Tapajós River, *Dahlgren and Sella 82* (US), *Swallen 3131* (US); Breves, *Pires and Silva 6682* (US); Castanhal, Bragança railroad, *Goeldi 300* (NY, RB, US); Fordlândia, Tapajós River region, *Krukoff 1047* (NY); Marabá, Serra dos Carajás, *Cavalcante 2117* (US); Óbidos, *Swallen 5081, 5090, 5092* (US); Sete Varas airstrip on Río Curuá, *Strudwick and Sobel 4311* (WIS). PARANÁ: Cadeado, *Hatschbach 14715* (US); Campo Morão, *Swallen 9010* (US); Cerro Azul, *Hatschbach 5037* (US); Morro do Farol, Caoiba, *Imaguire 158* (US); Paraná River near Pôrto Byington, *Lindeman and Has s 1717* (US); Pedra Branca de Araraquara, *Hatschbach 12878* (US); Pôrto de Cima, *Dusen 10257* (NY, US). PERNAMBUCO: Without locality, *Gardner 1198* (US); Antonio, *Saito 291b* (US); Fazenda Arabari, *Tenorio 66-198* (US). RIO DE JANEIRO: Alto Macahe, Nova Friburgo, *Glaziou 18620* (NY, P, US); Alto da Boa Vista, *Calderón 2028, 2030* (RB, US); Cascadura, *Holway and Holway 1473* (US); Cosme Velho toward Corcovado, Morro Novo Mundo, *Soderstrom et al. 1859* (CEPEC, US); Corcovado, *Flaster 1141* (US), *Rose and Russell 20216* (NY, US); Gávea, *Chase 9981* (US); Mt. Itatiaia, road between Monte Serrat and Ponte Maromba, *L.Smith 1439* (US); Itatiaia National Park, S face of Mt. Itatiaia, *Eiten and Eiten 6499* (US); Madalena, *Feio and Castro Faria s.n.* (US 2463828); Mage, Fazenda do Cortume, *Vidal II-3997* (US); Monte Serrat, Serra de Itatiaia, *Chase 8353* (US); Morro Novo Mundo, *Soderstrom et al. 1856* (US); Restinga de Jacarepaguá, at east side of Pedra de Itauma, *Soderstrom and Sucre 1915* (CEPEC, US); Rio de Janeiro, *Holway and Holway 1077* (US), *Chase 10004* (NY, US), *Calderón 2026* (US), *Nee 3400* (US); Serra do Corcovado, entre Vista Chinesa e Mesa do Emperador, *Calderón 2014* (RB, US); Serra da Mendanha, *Soderstrom and Sucre 1951* (US); Teresópolis, *Brade 9677, 9690* (US), *Emygdio 81* (US); Tijuca, *Chase 12152* (US); Vale de Bom Sucesso, Caixa d'Agua, *Soderstrom and Sucre 1983* (CEPEC, US), *Sucre 5844* (US), *Sucre 5850* (US); Vista Chinesa, *Schwacke s.n.* (US 2463831); Mata do Rumo, *Sucre 7684* (RB); Vista Chinesa, *Sucre 7659* (US); Alto da Pedra da Gávea, *Sucre 4335* (RB); Jacarepaguá, *Sucre 9606* (RB); alto da Boa Vista, *Sucre 1120, 1136* (RB); restinga da Tijuca, *Sucre 1057* (RB); Parque Nacional da Tijuca, *Lima 686* (RB); Mesa do Imperador, *Almeida 1985* (RB). RORAIMA: Mt. Roraima, ridge NW of Paulo, *Tate 162* (NY); Mt. Roraima, along Kukenam River at Roraima ford, Paulo, *Tate 182* (NY); Serra Tepequem, in quebrada near airstrip, *Maguire 40054* (NY); foothills of Serra Tepequem, near Igarapé Paparú, *Prance et al. 4341* (US); Serrinha, Rio Mucajaí, *Prance et al. 4187* (US); Serra dos Surucucus, S of Mission Station, *Prance et al. 10053* (US). SÃO PAULO: Butantan, *Kuhlmann 557* (US); Campinas, *Novaes 1280, 1281* (US); Campinas, Fazenda Santa Ana, *Viegas 5036, 5102* (US), Fazenda Riqueza, *Viegas 2876* (US); 25 km NW de Mogi Guaçú, *Gibbs and Leitao Filho 6098*

(US); São Paulo, Parque do Estado, *Calderón 2007* (US), *Fonseca 4* (US), *Skvortzov 167* (US), *Gehrt 12892* (US); Pirassumunga, *Pickel 5820* (US); Santos, *Vaccari s.n.* (US 1625216); Santos, Guaruja, *Holway and Holway 2014* (US); Santos, Monserrat, *Rosengurtt PE-3401* (US); S. José dos Campos, *Eiten and Mimura 3350* (US), *Lofgren 3831* (US); São Paulo, *Usteri 9975* (US), *Hoehne 29798* (NY, US); 2 km E of Sete Barras, *Clayton and Eiten 4670* (US); Xiririca, *Hoehne 24313* (US). SANTA CATARINA: Azambuja, *Calderón 2004* (US), *Klein 534* (NY, US), *Reitz 2214* (US); Blumenau, *Reitz and Klein 2201* (NY), *Ule 893* (US); Bom Retiro, *Bresolin 807* (US), *Klein and Souza 10519* (US); Braço do Norte, Río do Medio, *Mattos 7162* (US); Brusque, *Reitz 5732* (US); Mato de Hoffmann, *Smith and Veloso 5669* (US); Ibirama, *Klein 613* (US), *Reitz and Klein 3702* (US), *Smith and Klein 7569* (RB, US); Ilha de Santa Catarina, Morro da Lagoa, *Rohr 484* (US); Jordão, *Klein 9672* (US); Morro do Cambirela, *Bresolin 314* (US); Morro do Cavalo, *Reitz and Klein 955* (NY, US); Morro da Cruz, *Valls et al. 2734* (US); Morro da Fazenda, *Calderón 2005* (US); Morro da Quebrada, *Klein and Bresolin 8355* (US); Morro no Rio Tavares, *Klein and Bresolin 6244* (US); Pantano do Sul, *Klein et al. 7950* (US); Pilões, *Reitz and Klein 3802* (US); Praia Braba, *Reitz and Klein 1078* (US), *1082* (NY, US); Saco Grande, *Klein and Bresolin 8399* (US).

FIJI ISLANDS: Sandalwood Bay, anno 1838-1842, *Wilkes s.n.* (US).

FRENCH GUIANA: Layon point de Trijonction-Mitaraka, km 7.5, *Sastre 1585* (US); St. Jean, *Benoist 1284* (US); Saint Laurent, *Hoock 96* (NY, US); Route de St. Laurent, *Hoock s.n.*, 15 Apr 1961 (P); Tumuc Humac, *Hoock s.n.*, 23 Jan 1956 (P).

GUYANA: Maicwac River, *Altson 496* (US); Alubia Falls, Kamerang River, *Leakey 217* (NY, US); upper Demerara River, *Jenman 4119* (US); Kanuku Mountains, forest trail to Mt. Iraimakipang, *Goodland and Maycock 465* (US); Essequibo River, Moraballi Creek, near Bartica, *Sandwith 282* (US); Rockstone, *Gleason 624* (NY, US), *Hitchcock 17283* (NY, P, US), *Jenman 7548* (US); Mt. Roraima, *McConnell and Quelch 708* (NY, US).

PARAGUAY: Ibitimí, *Rojas 6110* (US); Paraguarí, *Rojas 12938* (US); Pedro Juan Caballero, *Rojas 6398* (US); Santa Teresa, *Bertoni 1688* (US); Sierra de Amambay, *Hassler 11314* (NY, P, US).

PERU, CUZCO: Consuelo, Asunción, *Vargas 7361* (US). HUÁNUCO: Río Azul, near Tingo María, *Ferreyra 12737* (US); without locality, *Anderson 867* (US). JUNÍN: Chanchamayo Valley, *Schunke 631* (US). LORETO: Vicinity Aguaytia, *Croat 20968* (MO). MADRE DE DIOS: Atalaya, vicinity of Hacienda Amazonia, 2–3 km west of village, *Foster and Wachter 7378* (MO).

SURINAM: Arrowhead Basin, *Maguire 24456* (NY); Brownsberg, *Lindeman 12504* (US); Coppename River near Raleighfalls, *Lanjouw 785* (US); 2 km S of Juliana Top, *Irwin et al. 54645* (US); near summit of Juliana Top, *Irwin et al. 54891, 54892* (US); area of Kabalebo Dam project, *Lindeman et al. 317* (US); hills 9 km N of Lucie and 12 km W of Oost riviers, *Maguire et al. 54232* (US); vicinity of Moengo, Cottica River, native trail to Adjoema Kondre village, *Cowan 39004* (NY); Nassau, *Lanjouw and Lindeman 2554* (NY); Saramacca River headwaters, Jacob kondre, *Maguire 23826* (NY, US); Zanderij II, *Maguire 23707* (NY, US).

VENEZUELA, AMAZONAS: Cerro Duida, *Steyermark 58075* (US); Cerro Huachamacari, Río Cunucunuma, vicinity of Camp II, *Maguire et al. 29941* (NY, US); Cerro Sipapo, vicinity of Base Camp, *Maguire and Politi 27987* (NY, US); Serranía Parú, Río Parú, Caño Asisa, Río Ventuari, *Cowan and Wurdack 31440* (NY, US); Yavita, *Williams 14007* (US). ANZOÁTEGUI: Medanos de Puerto La Cruz y El Morro, *Tamayo 20 99* (MO). APURE: Reserva Florestal San Camilo, *Steyermark et al. 101756* (MO). BOLÍVAR: Río Chizca, region de Urimán, *Bernardi 768* (NY); Gran Sabana, between waterfall at Rue-merú and Divina Pastora on Río Kukenán N of Santa Elena, *Steyermark 59224* (NY, US); Hato de la Divina Pastora, Gran Sabana, *Tamayo 2893* (US); Hacha, *Bernardi s.n.* (NY); Sierra Ichún, cercanías del Salto María Espuma del Río Ichún, base of the Sierra de Ichún, *Steyermark 90351* (NY, US); SE of La Queina, *Wurdack and Guppy 157* (NY, US); river banks of Raudal Maracca, about 110 river km from mouth, *Wurdack and Monachino 41046* (NY, P, RB, US); Isla El Casabe, Río Paragua, *Killip 37304* (NY, US). FALCÓN/LARA: Cerro Socopa, *Liesner et al. 8336* (MO). MÉRIDA: Along Río Onia, near Bolero, N of Mesa Bolívar, *Steyermark 56737* (NY, US). TÁCHIRA: region of La Fundación, *Liesner and González 10188* (MO), *Liesner et al. 9543* (MO), *van der Werff 4940* (MO). ZULIA: Departámento Colón, Casigua El Cubo, *Bunting et al. 6704*; Departámento Bolívar, entre Las Tres Marías y el Río Chiquito, *Bunting and Stoddart 9045* (MO); Departámento Perijá, Est. Hidrólogica Aricuaisa-Pie de Monte, *Bunting and Panapera 11024* (MO).

DISCUSSION.—*Olyra micrantha* is atypical of the genus in having thin-pedicellate female spikelets in which the glumes fall attached with the anthecium, and in the conspicuous internode between the lower and upper glume. This peculiarity is also present in the genera *Raddiella* and *Parodiolyra*, but these genera have a different type of caryopsis (in which the hilum does not reach the entire length of the caryopsis), female anthecium (not pitted), and inflorescence. Robust inflorescences of *O. micrantha* probably bear more spikelets than any other olyroid grass.

This is a weedy species with considerable morphological variability in the size of plants, leaf blades, panicles, and female glume size and pubescence. Many specimens from northern South America bear large leaves while in the South, as for example in São Paulo, Brazil, they are small and narrow. There is also variation in the ligule length with some populations from around Rio de Janeiro having very long ones. However, study of the specimens available showed that

intermediate types are frequent. An unpublished study made by Dr. Lynn G. Clark confirmed that large-leaved and small-leaved plants represented extremes of the same species.

Chromosome counts of n = 20 (Davidse and Pohl, 1974, 1978) and 2n = 40 (Gould and Soderstrom, 1967) have been reported for the species.

18. *Olyra obliquifolia* Steudel

FIGURES 11, 29, 30*a*,*b*

Olyra obliquifolia Steudel, 1853:36. [Type: "Hochst. Hrbr. *Kappler* nr. *1472* (non H.B.). Surinam." Holotype, P, not seen, fragments of the type and a photograph, US sheet nos. 2877937, 2975664; isotype, MO.]

Perennial, short-rhizomatous, borne in fascicles of 10–20 culms. *Culms* 0.3–2 m tall, erect or slightly geniculate at the base, simple, many-noded; internodes densely pilose with retrorse hairs to glabrous, cylindrical, hollow; nodes thickened, purplish, short-pubescent. *Leaves* 5–9 per complement; sheaths short and densely pilose to glabrous, strongly ribbed, the margins ciliate to glabrous, membranous; auricles present, small; ligule membranous, short-ciliate at the apex, 3–3.5 mm long, short-pubescent on the abaxial surface; pseudopetiole 0.2–0.4 cm long, densely to sparsely pilose, with whitish and stiff hairs to glabrous; blades narrowly oblong, 16–30 cm long, 4–9 cm wide, glabrous, narrowing to an asymmetric tip, narrowed and asymmetric basally, the margins ciliate to scabrous, the midnerve prominent on both surfaces, the lateral nerves anastomosing. *Inflorescences* umbelliform, borne from the uppermost nodes, panicles 12–16 cm long, 12–20 cm wide, each with a fascicle of 2–8 branches, the branches spreading and reaching approximately the same height, falling at maturity; peduncle hispid, the branches hispid toward the basal part, otherwise glabrous, triquetrous with one side flattened, with 1–4 terminal female spikelets and congested male

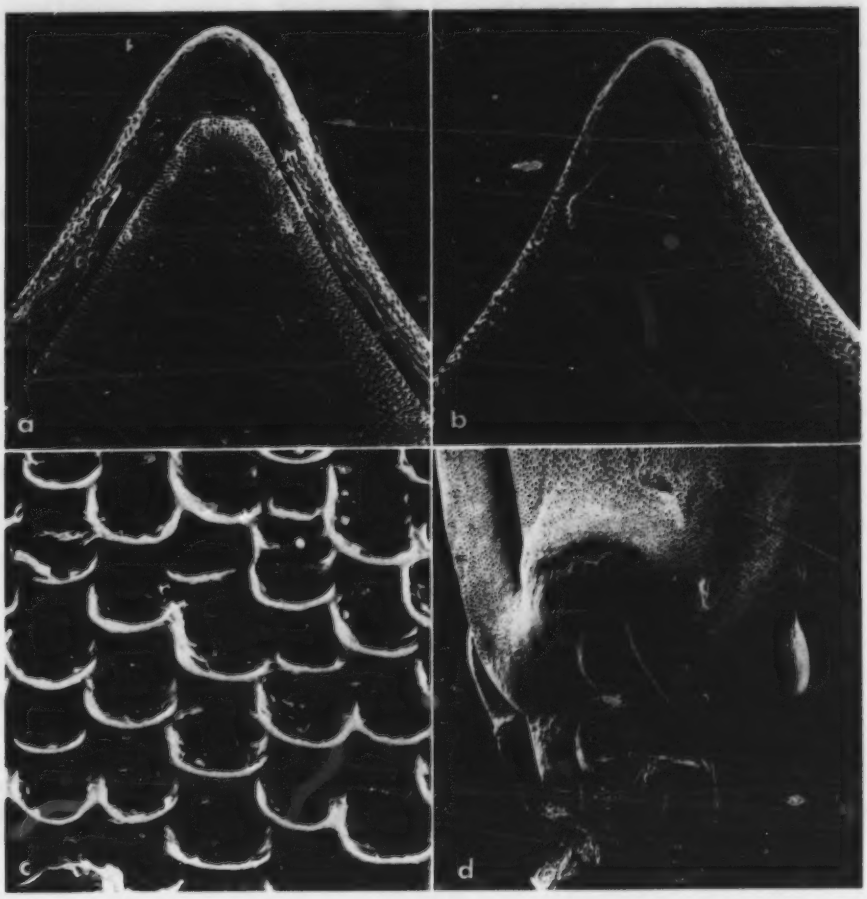


FIGURE 29.—Detail of female anthecium, *Olyra obliquifolia*: *a*, apex of the anthecium, ventral side (× 50); *b*, apex of the anthecium, dorsal side (× 40); *c*, detail of the excavations on palea (× 600); *d*, base of the anthecium showing stipe (× 30). Micrographs *a-c* of *Maguire 40720* (US), *d* of *Cavalcante 847* (US). (Reduced to 77% of indicated magnifications for publication.)

FIGURE 30.—Field photos of *Olyra* species. *O. obliquifolia*: *a*, habit of plant in forests of Brazil; *b*, detail of umbelliform panicle. *O. standleyi*: *c*, habit of plant, Panama; *d*, panicles; *g*, detail of a panicle. *O. glaberrima*: *e*, habit of plant, Brazil; *f*, detail of male and female spikelets. All photographs by C.E. Calderón, 1968.

spikelets below, the male spikelets borne alternately in pairs (or in groups of 4) along the branches; pedicels of the male spikelets short, hispid, those of the female spikelets thickened, short-pubescent; axils of the branches densely pilose. *Female spikelets* lanceolate, acuminate to short-aristate, 13–17 mm long, 3.4–4 mm wide, disarticulating above the glumes, brownish to purplish, densely papillose-pilose to sparsely pilose, occasionally glabrous; *glumes* acuminate to subulate apically, longer than the anthecium, 7–9-nerved with transverse veinlets, the nerves strong, hispid on the outer surface, more so toward the margins and apex to glabrescent, the inner surface densely pilose on the upper portion; upper glume 13–15 mm long; *anthecium* fusiform, acute, 9.2–11.5 mm long, 3.1–3.4 mm wide, glabrous, pale, separated from the glumes by a conspicuous stipe 0.6–1 mm long, the surface of the anthecium with hexagonal to rounded excavations. *Caryopsis* broadly ovoid, 5.8 mm long, 2.6 mm wide, dark brown; hilum linear, as long as the caryopsis. *Male spikelets* lanceolate, acuminate, 5.5–8.7 mm long, 0.8–1.3 mm wide, brownish to purplish, densely hirsute to scabrous; *lemma* acuminate, 3-nerved, densely hispid, more so toward the margins to scabrous; *palea* 5–8.1 mm long, 2-nerved, sparsely hispid with margins short-ciliate to glabrous; anthers 4 mm.

DISTRIBUTION.—Northern South America from Pará, Brazil, and Surinam east to Maranhão, Brazil (Figure 11), from sea level to 700 m elevation.

ADDITIONAL SPECIMENS SEEN.—BRAZIL, AMAPÁ: Mapati, km 116, *Black and Lobato 50-9686* (US); Rio Oiapoque, 5 km SE of Clevelândia, *Irwin et al. 47430* (NY); Rio Araguari, 1°26′N, 51°58′W, *Pires et al. 50803* (NY, US), vicinity of camp 12, 1°11′N, 52°8′W, *Pires et al. 51367* (F, NY, R, US); 40 km SW of Serra do Navio, Rio Cupuxi, *Dembros 304* (RB). MARANHÃO: Rio Pindaré, Monção, *Fróes 20302* (US); Rio Alto Turiaçú, Barraquinha, *Jangoux and Bahia 149* (MO); Turiaçú, *Rosa and Vilar 2746* (MO); S of Fazenda Guarany, km 133 of BR-316, *Daly et al. 166* (MO). PARÁ: Belém *Soderstrom 1192* (US), Belém I.P.E.A.N., *Calderón 2062* (US); 20 km S of Belém, *Irwin 5025* (US); Castanhal, Bragança railroad, *Goeldi 42, 74* (US), *301* (F, MO, NY, RB, US); Castanhal, Colônia 3 de Outubro, *Black 49-8592* (US); cabeceiras do Alumine, *Sampaio 5815* (R); road BR 22, Capanema to Maranhão, *Prance and Pennington 1870, 1895* (US), km 60, *Prance and Silva 58765* (F, MO, US), km 64, vicinity of Piritoro, *Prance and Silva 58872* (F, MO, US), *Prance and Pennington 1946* (F, US); km 167–173 da Estrada Belém-Brasília, *Oliveira 541* (IAN); Rio Capim, Caratateua, *Black 48-2368* (NY); Maguary, *Snethlage 117* (F); entre a fonte do Rio Mapuá e o Rio Piria, *Black 50-9826* (US); Marituba, Granja Imperial, *Pereira 5044* (US); Rio Parú de Oeste, *Cavalcante 847* (US); Igarapé Pixuna, *Black 48-2978* (US); Região Igarapé Pitoro, *Fróes 34731* (IAN); Santa Isabel, *Swallen 5045* (R, RB, US), *Pires and Black 1330* (RB).

FRENCH GUIANA: Itany, Village Tolinga, Machiri, *Hoock 97* (NY, US); Gregoire, *Deward 125* (US); sommet des Monts Atachi Bacca, *de Granville 785* (US); Inselberg, *Cremers 7451* (MO); Haut Maroni, *Sastre and Moretti 3849* (MO); Region de Camopi, Montagne Alikene, *de Granville B.5063* (US); Rivière Sinnamary a Petit Saut, *Cremers 5382* (US); Montagnes de la Trinite, *de Granville 5969* (US, WIS).

SURINAM: Kabelstation, *Essed 51* (MO, US); Lely mountains, 175 km SSE of Paramaribo, *Mori and Bolten 8427* (RB, US), *Lindeman et al. 50* (US); in montibus, qui dicuntur Nassau, *Lanjouw and Lindeman 2533* (NY); Nassau mountains, Marowijne River, Plateau A, 1 km E of Camp on line A, *Cowan and Lindeman 39032* (NY, US), occasional in forest on Line 12, Plateau A, *Maguire 40720* (F, NY, RB, US); Anelofoesie, Saramacca River, upstream from Nieuw Jacob Kondre, *J. and P. Florschütz 1655* (NY); Saramacca River, near Posoegronoe, *Maguire 24032* (F, MO, NY, RB, US); Tafelberg, 0.5 km S of East Ridge, *Maguire 24595* (NY, US); Zuid Rivier, 2 km above confluence with Lucie Rivier, *Maguire et al. 53971* (US), *Irwin et al. 55736* (F, MO, US); without locality, *Schwenitz s.n.* (NY).

DISCUSSION.—A remarkable feature of *Olyra obliquifolia* is the presence of umbelliform inflorescences, with all of the branches of the panicles whorled and reaching approximately the same height; every branch has male spikelets in pairs along one side of the axis. It is interesting to note that in this species, as in *O. tamaquareana*, all of the branches of the panicle fall at maturity, only the peduncles remaining at the top of the culm.

Olyra obliquifolia resembles *O. fasciculata* and *O. tamaquareana*. The three species are distinguished by the presence of a peg-like extension of the base of the anthecium that extends downward into a small cavity formed by the outer wall of the rachilla internode. Davidse (1987) reported that this stipe is full of oil and serves as a functional elaiosome for the dispersal of the seeds by ants.

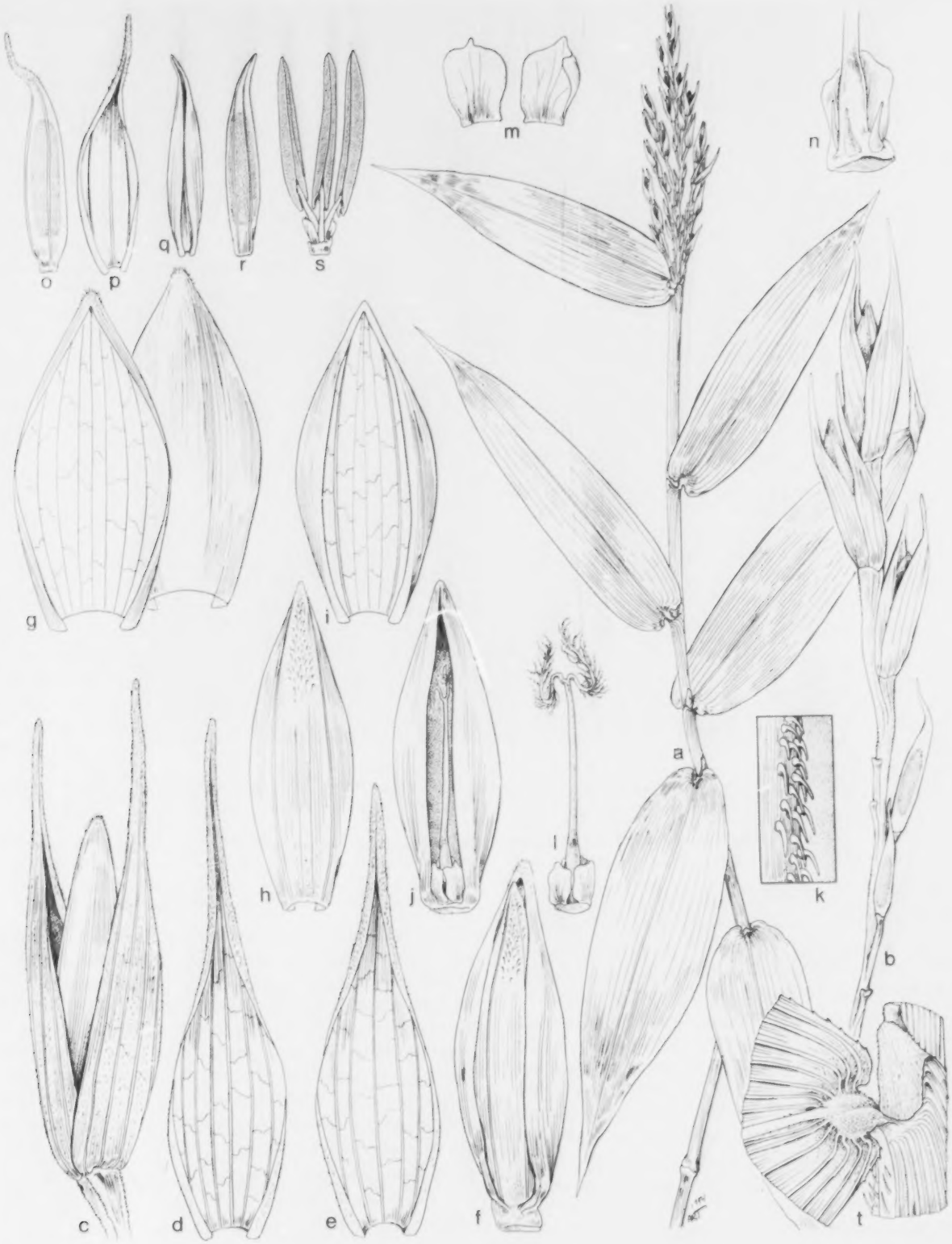
Chromosome numbers of 2n = 23, 44 (Gould and Soderstrom, 1967) have been recorded for the species. Flowers throughout the year.

19. *Olyra retrorsa* Soderstrom & Zuloaga, new species

FIGURES 11, 31, 32

TYPE SPECIMEN.—BRAZIL, MATO GROSSO: Rio Verde, Apr 1918, *Kuhlmann 1868* (holotype, RB; isotypes, IAN, RB).

FIGURE 31.—*Olyra retrorsa*: *a*, inflorescence terminating culms (× 0.6); *b*, branch of inflorescence (× 3.6); *c*, female spikelet (× 7); *d*, lower glume of female spikelet (× 7); *e*, upper glume of female spikelet (× 7); *f*, female anthecium (× 7); *g*, lemma of female anthecium, inside and outside view (× 7); *h*, palea of female spikelet, outside view (× 7); *i*, palea of female spikelet, inside view (× 7); *j*, palea of female spikelet with margins enclosing the flower (× 7); *k*, enlargement of tip of palea showing retrorse hairs (× 30); *l*, gynecium and lodicules (× 7); *m*, lodicules of female spikelet (× 15); *n*, base of pistil with lodicule and staminodes (× 15); *o*, male spikelet, side view (× 7); *p*, lemma of male spikelet (× 7); *q*, palea of male spikelet, empty (× 7); *r*, palea of male spikelet enclosing flower (× 7); *s*, andrecium and lodicules (× 11); *t*, ligule and upper surface of pseudopetiole (× 4.2). All components based on *Kuhlmann 1868* (RB). Illustration by A.R. Tangerini.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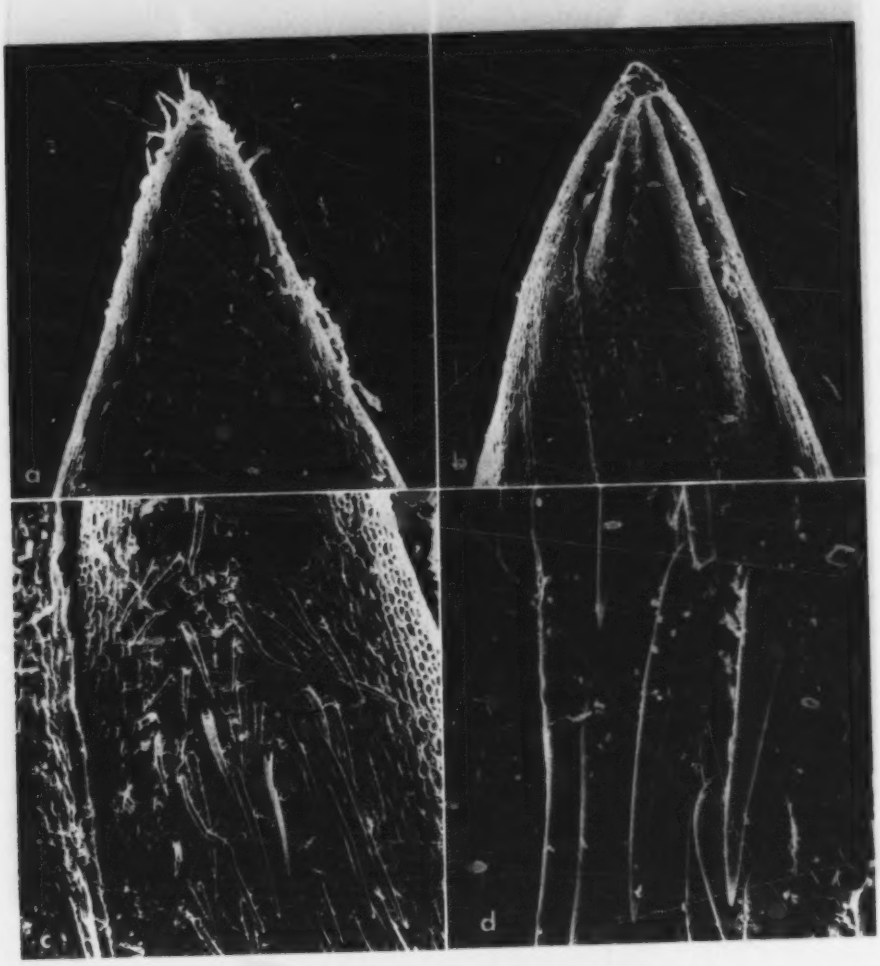


FIGURE 32.—Detail of female anthecium, *Olyra retrorsa*: *a*, apex of the anthecium, dorsal side showing sparse bicellular microhairs (× 50); *b*, apex of the anthecium, ventral side (× 40); *c*, detail of retrorse unicellular hairs and bicellular microhairs on the surface of the palea (× 100); *d*, detail of retrorse, unicellular macrohairs (× 500). All micrographs of *Kuhlmann 1868* (RB). (Reduced to 77% of indicated magnifications for publication.)

Gramen perenne. *Culmis* erectibus, non ramosus ad basis; nodi incrassati, glabri. *Laminae* lanceolatae, 10.5–13.2 cm longae, 2.7–3.4 cm latae, basi symmetricae, subcordatae, apice symmetricae, subulatae; pseudopetioli 0.2–0.3 cm longi, pilosi breviter; ligulae membranaceae, apice ciliatae breviter, 2.5–4 mm longae. *Paniculae* oblongae, contractatae, 6–10 cm longae, 1–2 cm latae. *Spiculae femineae* lanceolatae, subulatae, 13.8 mm longae, 3.1 mm latae, glumis inter se subaequalibus, glabris; gluma inferior subulata, 5–7-nervis, nervis tessellatis; gluma superior subulata, 11.6–12.8 mm longa, 5–7-nervis, nervis tessellatis; anthoecium lanceolatum, acuminatum, 8.5–8.7 mm longum, brunneum, excavatum minute; lemma 5-nerve, apice pilosum breviter; palea 2-nervis, apice pilosa. *Spiculae masculae* lanceolatae, 9–9.7 mm longae, 0.8–1 mm latae, aristatae, glabratae; lemma 3-nerve, aristatum; palea acuminata, 5.3–7.5 mm longa, 2-nervis.

Perennial. *Culms* erect, unbranched; internodes cylindrical, hollow, pubescent; nodes thickened, brownish, glabrous. *Leaves* with sheaths stramineous, papillose-pilose with appressed, caducous hairs; auricles membranous; ligules membranous, conspicuous, 2.5–4 mm long, short-ciliate at the apex, glabrous and shiny on the adaxial surface, short-pubescent on the abaxial; pseudopetiole 0.2–0.3 cm long, short-pilose; blades lanceolate, 10.5–13.2 cm long, 2.7–3.4 cm wide, subcordate and symmetric basally, subulate and symmetric apically, drooping, the midnerve not prominent, papillose-pilose toward the base of the blade on the abaxial surface, the rest of the surface glabrous, the margins scabrous to glabrous. *Inflorescences* oblong, contracted; panicles borne from the

uppermost nodes, 6–10 cm long, 1–2 cm wide, the branches alternate; *axis* longitudinally ridged, hispid, the branches triquetrous, scabrous to short-hispid, the lower branch bearing only male spikelets, the upper ones with pairs of male spikelets on either side of the triquetrous axis, one subsessile, the other short-pedicelled, 1–4 terminal female spikelets on each branch, pedicels of the female spikelets thickened, short-hispid. *Female spikelets* lanceolate, subulate apically, 13.8 mm long, 3.1 mm wide, the glumes subequal, glabrous; *lower glume* subulate, 5–7-nerved with transverse veinlets, scabrous toward the apex on the outer surface, pilose toward the apex on the inner surface; *upper glume* subulate, 11.6–12.8 mm long, 5–7-nerved with transverse veinlets, the pubescence similar to that of the lower glume; *anthecium* lanceolate, acuminate apically, 8.5–8.7 mm long, 2.9 mm wide, brownish, slightly pitted with oblong excavations; *lemma* 5-nerved, with bicellular microhairs and long, unicellular macrohairs toward its apex; *palea* 2-nerved, with long, retrorse unicellular hairs toward the middle portion and the apex. *Male spikelets* lanceolate, 9–9.7 mm long, 0.8–1 mm wide, aristate, glabrous; *lemma* 3-nerved, glabrous, brownish, aristate, the awn scabrous; *palea* acuminate, 5.3–7.5 mm long, 2-nerved, sparsely pilose toward the middle, otherwise glabrous, brownish; anthers 3.1 mm long.

DISTRIBUTION.—Endemic to Mato Grosso, Brazil (Figure 11), and known only from the type locality.

DISCUSSION.—While *O. retrorsa* shares with *O. taquara* the same type of blade morphology and ornamentation of the female anthecium, the retrorse hairs on the female palea and bicellular microhairs at the tip of the female lemma of the former species have no counterpart in the genus. Due to the lack of material it is not known whether the species flowers irregularly, as does *O. taquara*.

20. *Olyra standleyi* Hitchcock

FIGURES 30c,d,g, 33, 34

Olyra standleyi Hitchcock, 1927:86. [Type: "In the U.S. National Herbarium, no. 1307238, collected in moist forest, at El Muñeco on the Río Navarro, Province of Cartago, Costa Rica, alt. 1400 to 1500 m, March 6 to 7, 1926, by *Paul C. Standley* and *Ruben Torres* (no. *50932*)." Holotype, US sheet no. 1307238.]

Robust arching or clambering perennials from thick creeping short-rhizomatous rootstocks. *Culms* up to 3 m tall, decumbent and geniculate at the lower nodes, branching sparingly from the middle and upper nodes; internodes glabrous, hollow, up to 35 cm long and 1 cm diameter; nodes dark brown and with short, retrorse whitish hairs to glabrous, flared, formed by the thickened basal rim of the sheath above and the thickened upper rim of the internode below. *Leaves* with sheaths strongly ribbed, glabrous to sparsely papillose-pilose, with caducous, glassy hairs; auricles membranous, glabrous; ligules membranous, ~1 mm long; pseudopetiole broad, brownish, flat, 0.3–0.5 cm long, ~0.5 cm wide, glabrous to sparsely pilose on both surfaces; blades ovate to oblong-lanceolate, 14–30 cm long, 4–7 cm wide, greenish to purplish at the base, the base symmetric, cordate, narrowed abruptly to an acute to subulate and symmetric to slightly asymmetric apex, the abaxial surface glaucous, the midnerve prominent, the margins short to long-ciliate toward the base to completely glabrous. *Inflorescences* paniculiform, borne on the 8 or 9 upper nodes; panicles 9–17 cm long, 5–25 cm wide, with simple branches stiffly ascending or spreading from the axis, with 1–3 female spikelets borne terminally on each branch and numerous, paired (or in groups of 4) male spikelets below, one subsessile, the other short- to long-pedicelled, the panicles exserted on long, glabrous to short-pilose peduncles ~40 cm long, the lower branches whorled, the upper ones whorled to alternate or opposite; *axis* longitudinally ridged and sparsely to densely pubescent, flattened on one side with the spikelets all borne on the other side; axils of the branches pilose. *Female spikelets* 18–25 mm long, 2.2–3 mm wide, pale green to brownish or purplish, the glumes attenuate, unequal and longer than the anthecium, glabrous to occasionally hispid; *lower glume* 5–7-nerved with transverse veinlets, glabrous to sparsely hispid toward the base and more so toward the apex to hispid, the inner surface pilose toward the apex; *upper glume* shorter than the lower, 12.5–19 mm long, 5–7-nerved with transverse veinlets, with a pubescence similar to that of the lower glume; *anthecium* fusiform, 8–9.5 mm long, 1.9–2.5 mm wide, whitish to stramineous, pitted with oblong to ovate excavations, the apex of the palea covered with bicellular microhairs and short prickle hairs; *lemma* 5–7-nerved; *palea* 4-nerved; lodicules ~1 mm long. *Caryopsis* fusiform, brownish, 6.3 mm long, 2 mm wide; hilum as long as the caryopsis. *Male spikelets* lanceolate, aristate, 10–14 mm long, 0.9–1.5 mm wide, purplish, glabrous to hispid; *lemma* aristate, 3–5-nerved with transverse veinlets, glabrous to scabrous or hispid; *palea* 5–10 mm long, 2-nerved; anthers orange-yellow, 5–7 mm long.

DISTRIBUTION.—Cloud forests of Costa Rica, Panama, and Venezuela (Figure 34), at elevations from 900 to 2700 m (occurs at lower elevations in Venezuela).

ADDITIONAL SPECIMENS SEEN.—COSTA RICA, CARTAGO: Along primitive road, 1 km S of El Muñeco, *Pohl and Davidse 11698* (US); 8 km S of Cartago by air, Finca El Chaparral, 4.5 km S of bridge on Agua Caliente at Lourdes, *Liesner and Judziewicz 14606* (MO, US, WIS); El Muñeco, S of Navarro, *Standley 33878* (Paratype, US).

PANAMA, PANAMÁ: Cerro Jefe, *Calderón 2081* (US), *Calderón and Dressler 2123* (US), *Folsom et al. 2009* (US), *Soderstrom 2008* (US), *J.T. and F. Witherspoon 8482* (US); vicinity of Cerro Jefe, *Lewis and Dressler 7558* (US).

VENEZUELA, AMAZONAS: Caño San Miguel, Río Guianía, *Williams 3391* (MO). DISTRITO FEDERAL: Along ridge of the Ávila, *McClure 21246* (US); cordillera del Ávila, between Los Venados and Pico Oriental, *Steyermark 55597* (US); near summit of El Junquito, *Chase 12447* (US), *McClure 21239* (US); en selvas nubladas de Galipán, *Tamayo 1381* (F). GUÁRICO: En las orillas de la Laguna del Salvaje, *Tamayo*

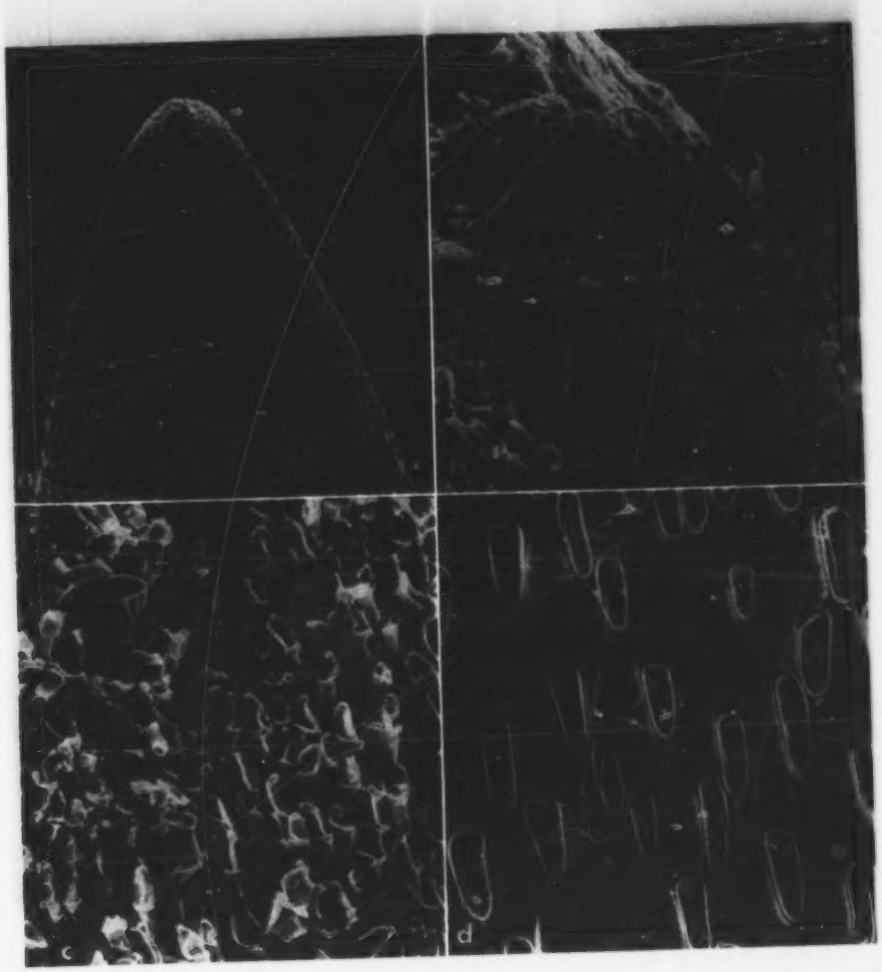


FIGURE 33.—Detail of female anthecium, *Olyra standleyi*: *a*, apex of the anthecium, dorsal side (× 50); *b*, detail of the apex of the palea showing numerous prickle hairs (× 250); *c*, detail of the apex of the palea showing numerous bicellular microhairs (× 400); *d*, detail of the surface of the lemma with oblong excavations (× 200). All micrographs of *McClure 21246* (US). (Reduced to 77% of indicated magnifications for publication.)

3391 (F). ZULIA: Sierra de Perijá, loma arriba de la quebrada del Río Omira-Kuna (Tumuriasa), SE de Pishikao e Iria hacia la mision Sucurpo, *Steyermark and Dunsterville 105686* (MO).

DISCUSSION.—When collecting *Olyra standleyi* in Venezuela, McClure (herbarium label) stated that the plants showed signs of dying after flowering, at least the aerial parts. A similar observation was made by Soderstrom on Cerro Jefe, Panama, where the whole population of the species flowered and died in 1973, with seedlings produced. The plants often grow in huge, sterile clones.

The elevations (1400 m in Costa Rica, 1000 m in Panama, and 2700 m in Venezuela) at which this species occurs are the highest for any olyroid grass, and, indeed, for any herbaceous bambusoid. The Amazonas and Zulia, Venezuela plants are from lower elevations. Flowering has been recorded from October through April.

The spikelets of *Calderón 2081* are densely hispid, while in the rest of the specimens examined they are nearly glabrous.

21. *Olyra tamanquareana* Soderstrom & Zuloaga, new species

FIGURES 11, 35

TYPE SPECIMEN.—BRAZIL, AMAZONAS: Rio Negro, Ilha Tamanquare, downstream near Santa Isabel do Rio Negro (Tapuruquara), Sep 12, 1979, *K. Kubitzki, C.E. Calderón and H.H. Poppendieck 79-252* (holotype, INPA; isotypes, K, MO, LE, NY, SI, US).

Gramen perenne, caespitosum. *Culmis* 10–20 in fasciculis

FIGURE 34.—Distribution of *Olyra ecaudata*, *O. standleyi*, and *O. taquara*.

densis, non ramosus ad basim, 60–120 cm longis; nodi compressi, glabri. *Folia* per complementum 3–7; laminae lanceolatae, 13–25 cm longae, 3–5.5 latae, basi asymmetricae, angustatae, glabrae; pseudopetioli ~0.4 cm longi, pilosi; ligulae membranaceae, apice ciliatae breviter, ~3 mm longae. *Panicu-lae* contractatae. *Spiculae femineae* lanceolatae, longe aristatae, 35 mm longae, 4.2 mm latae, glumis inter se subaequalibus, anthoecio longioribus; gluma inferior 9–13-nervis, nervis tessellatis; gluma superior 9–11-nervis, nervis tessellatis, stipite prominentis, 1–1.2 mm longis; anthoecium lanceola-tum, 13–13.2 mm longum, 3.5–3.8 mm latum, glabrum, excavatum valde; lemma 5-nerve. *Spiculae masculae* lanceola-tae, acutae, 5 mm longae, 1 mm latae, pilosae; lemma 3-nerve; palea 2-nervis.

Cespitose, robust perennials from creeping rootstocks, forming dense clumps with 10–20 culms in a fascicle. *Culms* erect, geniculate at the base, 60–120 cm tall, unbranched at the lower and median nodes, branching toward the upper nodes; internodes hollow, glabrous, the lower ones with a sheath only or with a rudimentary blade; nodes dark, compressed, glabrous. *Leaves* 3–7 per complement; sheaths strongly ribbed, with the margins shortly ciliate, otherwise puberulous; auricles membranous; ligule membranous, ~3 mm long, shortly ciliate at the tip; pseudopetiole dark brown, ~0.4 cm long, short-to

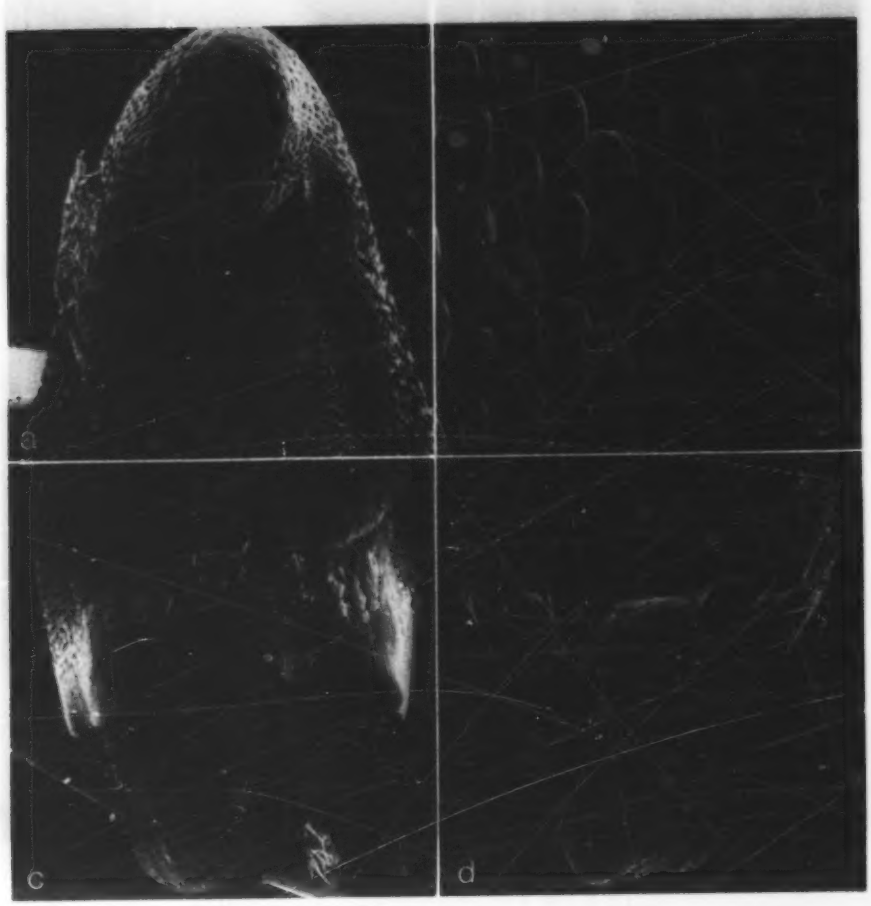


FIGURE 35.—Detail of female anthecium, *Olyra tamanquareana*: *a*, apex of the anthecium, ventral side (× 100); *b*, detail of excavations (× 200); *c*, base of the anthecium showing stipe, dorsal side (× 40); *d*, base of the anthecium showing stipe, ventral side (× 40). All micrographs of *Kubitzki et al. 79-252* (US). (Reduced to 77% of indicated magnifications for publication.)

long-hispid on both surfaces; blades lanceolate, flat, 13–25 cm long, 3–5.5 cm wide, narrowing to an asymmetric base, the apex acuminate and aymmetric, glabrous, the margins smooth, scabrous toward the apex, the midnerve conspicuous, the lateral nerves anastomosing. *Inflorescences* paniculiform and numerous (5–7), borne at the uppermost nodes, long-exserted, peduncles longitudinally ridged, shortly hispid, panicles falling completely at maturity, only the peduncles remaining, contracted, formed by a single branch (occasionally two conjugate branches present), each branch with the axis flattened or triquetrous, with male spikelets shortly pedicelled, spaced and alternate in groups of 4 below, and one terminal female spikelet per branch; *axis* shortly hispid, pedicels of the male spikelets short, hispid, those of the female spikelets thickened, shortly hispid. *Female spikelets* lanceolate, long-aristate, 35 mm long, 4.2 mm wide, the glumes subequal, scaberulous to shortly hispid on the outer surface, densely hispid toward the apex on the inner surface, the anthecium less than $^1/_2$ the length of the spikelet; *lower glume* 9–13-nerved with transverse veinlets; *upper glume* 9–11-nerved with transverse veinlets; stipe conspicuous at the base of the anthecium, ~1–1.2 mm long; *anthecium* lanceolate, 13–13.2 mm long, 3.5–3.8 mm long, glabrous, pitted, with rounded excavations over the entire surface, mottled at maturity; *lemma* 5-nerved. *Caryopsis* fusiform, brownish, 9 mm long, 2.5 mm wide; hilum linear, as long as the caryopsis. *Male spikelets* lanceolate, acute, 5 mm long, 1 mm wide, shortly hispid on the outer surface, smooth and shining on the inner surface; *lemma* 3-nerved, *palea* 2-nerved; anthers 1.8 mm long.

DISTRIBUTION.—Known only from the type locality, a dense forest along the Rio Negro in Amazonas, Brazil (Figure 11); *Prance et al. 15797* (NY, US), from the same locality, is an

immature plant that may also be referable to this species.

DISCUSSION.—*Olyra tamanquareana* resembles *O. obliquifolia*, from which it differs in having panicles with but a single (occasionally two) branch present with only one terminal female spikelet per branch, and in the larger female spikelets.

22. *Olyra taquara* Swallen

FIGURES 34, 36, 37

Olyra taquara Swallen, 1966:86. [Type: "In the U.S. National Herbarium, No. 2434254, collected in swamp forest at Ribeirão Grande, Municipio Jataí, Goiás, Brazil, July 25, 1956, by *A. Macedo* (No. *4586*)." Holotype, US sheet no. 2434254; isotype, US sheet no. 2434255.]

Robust erect perennials in dense clumps of as many as 30 culms from a thick creeping short-rhizomatous base. *Culms* up to 3.5 m tall, unbranched at the base, and branching toward the upper nodes; internodes cylindrical, glabrous, hollow and smooth, up to 1 cm in diameter, the basal internodes with a sheath only or with a rudimentary or reduced blade; nodes conspicuous, flared, dark brown and glabrous to short-pubescent, formed by the thickened basal rim of the sheath above and the thickened upper rim of the internode below. *Leaves* with sheaths strongly ribbed, glabrous to pubescent with glassy, caducous and brownish hairs all over the surface, pale green and strongly mottled with dark purple spots; ligule membranous, brownish, 0.7–1.4 mm long; pseudopetiole brownish, broad, flat, 0.3–0.4 cm long, shortly pubescent, usually recurved and positioning the blade downward; blades ovate to oblong-lanceolate, 21–32 cm long, 5.6–8 cm wide, narrowed abruptly to an acuminate and symmetric apex, cordate and symmetric basally, pale to purplish around the midnerve at the juncture with the pseudopetiole, glabrous on the adaxial surface, the abaxial surface glabrous to sparsely pubescent with short, appressed hairs and covered with

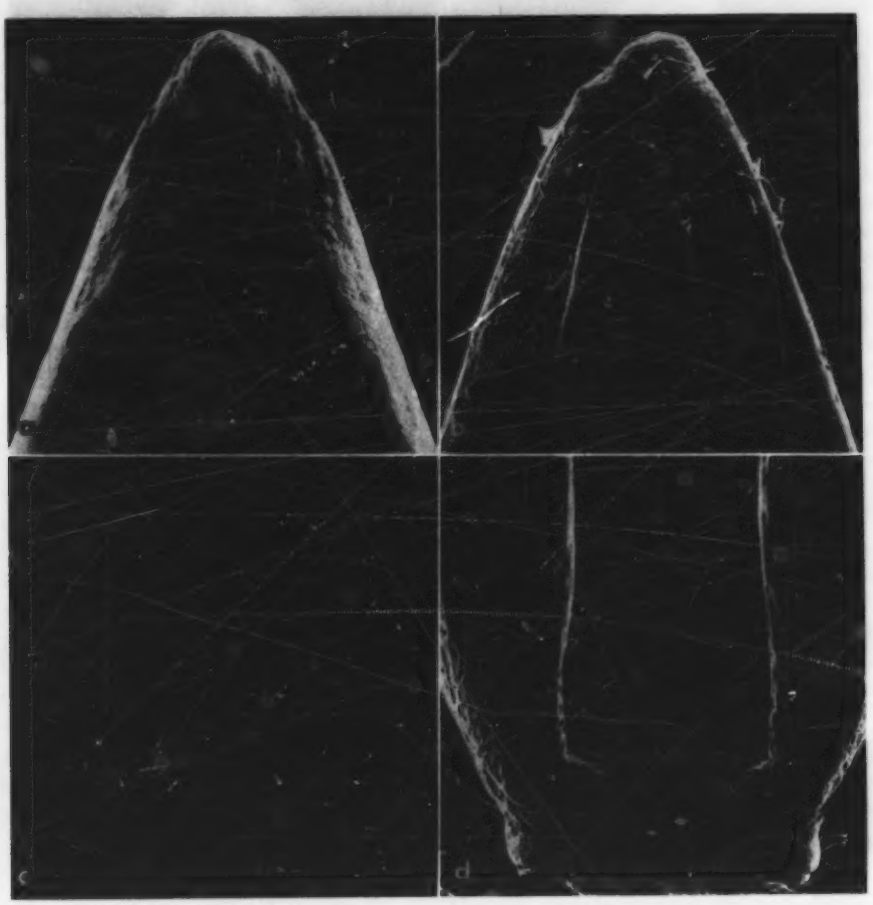


FIGURE 36.—Detail of female anthecium, *Olyra taquara*: *a*, apex of the anthecium, dorsal side (× 50); *b*, apex of the anthecium, ventral side (× 50); *c*, detail of the surface of the lemma showing excavations (× 100); *d*, detail of the base of the anthecium (× 50). Micrographs *a*, *d* of *Irwin and Soderstrom 5873* (US), *b*,*c* of *Richards 6804* (US). (Reduced to 77% of indicated magnifications for publication.)

FIGURE 37.—Field photo of *Olyra taquara* (photograph by T.R. Soderstrom, Brazil, 1964), with Brazilian botanist Romeu Belém.

brownish, caducous hairs toward the base, about the same color as the upper one (purplish in young leaves), the margins scabrous. *Inflorescences* paniculiform, borne from the uppermost nodes, 10–23 cm long, 10–30 cm wide, the lower branches whorled, ~13–20 cm long, the upper ones alternate, ascending or spreading from the axis, the panicles exserted on long glabrous peduncles, these becoming sparingly pubescent toward the panicle; *axis* strongly angled and sparingly pilose, the branches sparingly pilose and flattened on one side, the axils of the branches pilose, each branch with male spikelets in pairs, one short- and the other long-pedicellate and to several on fine tertiary branchlets all along the branches; the terminal female spikelets 2 to 4 on each branch. *Female spikelets* fusiform, 16–20.5 mm long, 2.2–3 mm wide, pale green to stramineous, mottled with purple spots, shining, the glumes subequal and subulate to aristate, longer than the anthecium;

lower glume aristate, 5-nerved with transverse veinlets, the inner surface shortly and densely pilose, the outer surface scabrous toward the apex, otherwise glabrous; *upper glume* 12.6–17.7 mm long, subulate to aristate, 5-nerved with some transverse veinlets, with a pubescence similar to that of the lower glume; *anthecium* fusiform, 8.4–9.2 mm long, 2–2.7 mm wide, whitish, indurate, irregularly pitted with small excavations; *lemma* 5-nerved. *Caryopsis* fusiform, brownish, 6.2 mm long, 2.6 mm wide; hilum 5.6 mm long, almost reaching the entire length of the caryopsis. *Male spikelets* lanceolate, purplish, 10.4–14.1 mm long, 0.9–1.3 mm wide, aristate, glabrous; *lemma* awned, 3-nerved; palea 7.8–10.3 mm long, 2-nerved, glabrous.

DISTRIBUTION.—Found in the shade of gallery forests in central Brazil (Figure 34), from 300 to 1000 m elevation.

ADDITIONAL SPECIMENS SEEN.—BRAZIL, DISTRITO FEDERAL: Colegio Agricola de Brasília, *Pires and Mattos 9865* (US), *Mattos and Heringer 351* (RB, US); 35 km E of Brasília, *Irwin and Soderstrom 5420* (US); Brasília, terrenos do Country Club, *Sucre 446* (RB, US); Parque Municipal de Gama, ~20 km S of Brasília, *Irwin and Soderstrom 5873* (F, MO, US); slopes of Chapada da Contagem, ~20 km E of Brasília, *Irwin and Soderstrom 5203* (US). GOIÁS: Ribeirão Grande, *Macedo 4580* (US); Rio da Prata, vicinity of Posse, *Irwin et al. 14569* (F, MO, RB, US). MATO GROSSO: Serra do Roncador, vicinity of Chavantina, margin of Rio Mortes, *Prance et al. 59092, 59108* (F, MO, US, WIS); Ponte de Pedra, *Kuhlmann 1869* (IAN, RB); ~270 km N of Xavantina, 12°54′S, 51°52′W, *Ratter et al. 1505* (US); 5 km W of the Rio Suia-Missu Ferry, ~290 km N of Xavantina, *Ratter et al. 1425* (US); 260 km along new road NNE of village of Xavantina, *Eiten and Eiten 8615* (US). MATO GROSSO DO SUL: ~5 km N of Xavantina, *Irwin and Soderstrom 6327* (US); Base Camp Square, 12°49′S, 51°46′W, *Richards 6804* (RB, US). MINAS GERAIS: Horto Florestal de Paraopeba, *Heringer 9171* (UB, US). PARÁ: Serra do Cachimbo, *Pires et al. 6261* (IAN).

DISCUSSION.—This species resembles *Olyra ecaudata* of the tropical forests of northern South America and *O. standleyi* of Venezuela, Panama, and Costa Rica. In all three, the leaf blades are conspicuously symmetric at base (and often subcordate with a small purple spot), while the female anthecium is completely pitted with small excavations over its entire surface.

Also, the whole plant when in flower, between May and September, produces numerous inflorescences but few leaves. Soderstrom examined large clumps near Brasília in 1983 and found no signs of flowering on the culms; as these were old, mature culms it seemed apparent that flowering is not annual and may be a one-time event ending with death of plant. This phenomenon should be studied in *O. ecaudata, O. standleyi,* and *O. taquara.*

The common name is recorded in Brazil as "taboquinha." The chromosome number is 2n = 20 (Gould and Soderstrom, 1967).

23. *Olyra wurdackii* Swallen

FIGURES 11, 38

Olyra wurdackii Swallen, 1966:85. [Type: "Type in the U.S. National Herbarium, No. 2307269 and 2307270, collected at edge of open rock on crystalline dome on right bank of Río Siapa just below Raudal Gallineta, Territory Amazonas, Venezuela, altitude 300–500 m, July 21, 1959, by *John J. Wurdack and L. S. Adderley* (No. *43540*)." Holotype, US sheet nos. 2307269, 2307270.]

Perennial in cespitose clumps. *Culms* 1–4 m tall, branching at the upper nodes, erect; internodes hollow, short-pubescent; nodes thickened, conspicuous, densely pilose with short, whitish, appressed hairs. *Leaves* with sheaths greenish, short-pubescent, the borders ciliate toward the upper portion, otherwise glabrous; ligule membranous, short-ciliate or not at the tip, 4–8 mm long, brownish; pseudopetiole short, dark brown, glabrous; blades lanceolate, 26 cm long, 5.2 cm wide, the apex symmetric, subulate, with a symmetric, subcordate base, glabrous on both surfaces, glaucous (to purplish near the base), the midnerve inconspicuous, the basal borders ciliate. *Inflorescences* paniculiform; panicles axillary and terminal at the upper nodes, ~30 cm long and 20–25 cm wide, many-flowered, the branches divergent to ascendent, the lower ones whorled, the upper alternate to opposite, each branch with many male spikelets below and 2–5 terminal female spikelets above; pedicels of the male spikelets short, disposed in short tertiary branchlets; *axis* of the panicles longitudinally ridged, densely hirsute, the axis of the branches triquetrous, hispid, purplish, pedicels of the female spikelets thickened, hispid. *Female spikelets* lanceolate, acuminate, 7–7.5 mm long, 2.2–2.5 mm wide, the glumes subequal, densely to sparsely hispid on the dorsal surface to glabrescent, densely pilose toward the apex on the ventral surface; *lower glume* acuminate, 9-nerved, with transverse veinlets; *upper glume* acuminate, 7–7.5 mm long, 7–9-nerved, with transverse veinlets; *anthecium* ovoid, acute, 5.5 mm long, shortly stipitate, smooth and shining, whitish; *lemma* with long prickle hairs toward the basal margins; *palea* with short prickle hairs and numerous bicellular, bottle-like microhairs on the upper portion. *Male spikelets* 8.9–11.5 mm long, 0.8–1 mm wide, greenish to purplish; *lemma* 3-nerved, scabrous on the dorsal surface, glabrous on the ventral one, long-aristate, the awn 2.5–4 mm long; *palea* 7.5–8.8 mm long, 2-nerved, glabrous, short-aristate; anthers 3, 4–4.3 mm long.

DISTRIBUTION.—Known only from two collections from the Amazonian region of Venezuela and Brazil (Figure 11).

ADDITIONAL SPECIMENS SEEN.—BRAZIL. AMAZONAS: Manaus-Pôrto Velho Highway, km 246, 4 km S of Igapo Açú, *Prance et al. 20531* (US).

DISCUSSION.—The affinities of *O. wurdackii* are not clear. The species is unusual in that the male spikelets are larger than the female, and the female anthecium is completely smooth and shining with conspicuous bicellular microhairs and prickle hairs at the apex of the palea.

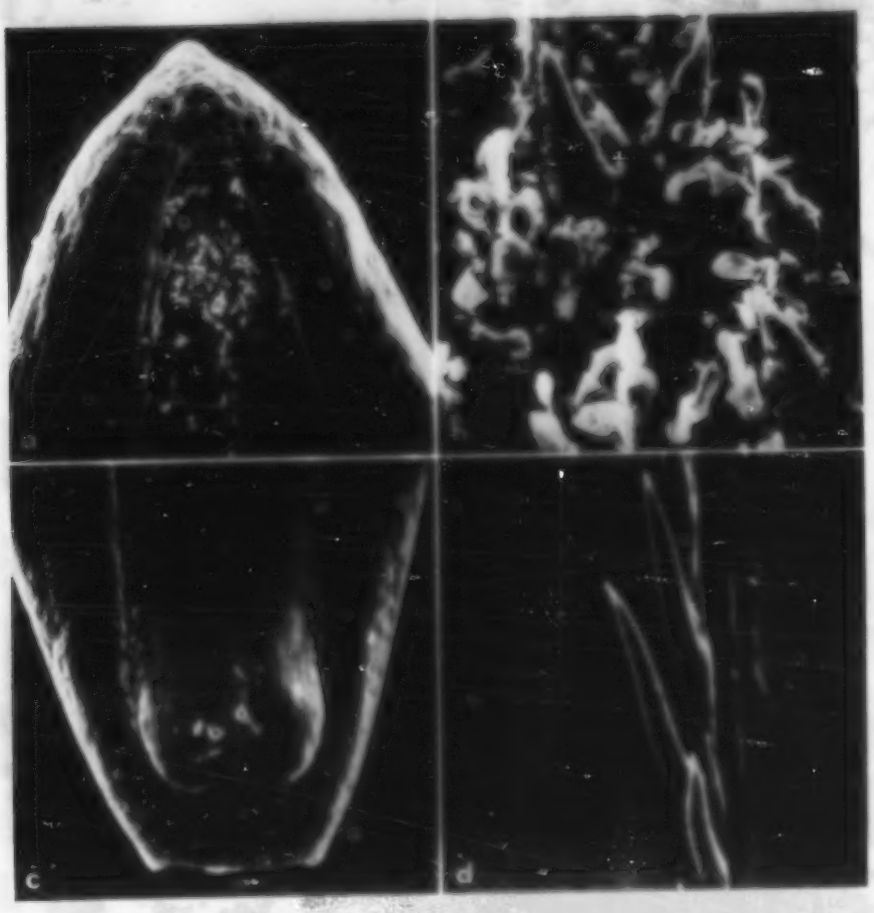


FIGURE 38.—Detail of female anthecium, *Olyra wurdackii*: *a*, apex of the anthecium, ventral side (× 100); *b*, detail of the apex of the palea showing prickle hairs and short bicellular microhairs (× 500); *c*, base of the anthecium, ventral side (× 50); *d*, detail of hairs on margin of the lemma (× 400). All micrographs of *Prance et al. 20531* (US). (Reduced to 77% of indicated magnifications for publication.)

Parodiolyra Soderstrom & Zuloaga, new genus

Gramen herbaceum scandens, perenne. *Culmi* supra nodi medium profuse ramificantes profuse. *Lamina* ovato-lanceolata vel lanceolata, ad basim asymmetrica truncata, ad apicem asymmetrica, acuminata; pseudopetiolus brevis, pilosus; ligulae breves, membranaceo-ciliatae. *Inflorescentiae* paniculatae, laxae, diffusae, e nodis superioribus productae, ramis inferioribus masculis, ramis superioribus cum spiculis femineis infra et spiculis masculis supra (vel ramis superioribus cum spicula feminea 1); pedicelli feminei filiformes. *Spiculae* 1-florae, unisexuales. *Spicula feminea* decidua; glumae 2 subequales, brevipilosae, quam anthoecium longiores, inflatae vel induratae; rachilla inter glumas incrassata, pulviniformis; gluma inferna 5–9-nervata amplectens; gluma superna 3–6-nervata; anthoecium ellipsoideum, induratum laeve, nitidum, apice acuto vel obtuso; lemma 5-nervatum tesselatum; palea 2-nervata; lodiculae 3; stylus singularis; stigmata 2. *Caryopsis*: hilum lineare quam caryopsis ½–¾ longius. *Spiculae masculae* fusiformes, acuminatae, hispidae vel laeves; lemma 3–4-nervatum; palea 2-nervata; stamina 3.

Perennial monoecious herbs. *Culms* vine-like, arching and clambering, profusely branching from the median and upper nodes; internodes hollow, cylindrical; nodes thickened, pilose with retrorse hairs. *Leaves* with sheaths glabrous to pilose; ligule membranous-ciliate, small; pseudopetiole short, pilose; blades ovate-lanceolate to lanceolate, flat, stiff, asymmetric and truncate at the base, tapering to an acuminate, asymmetric apex. *Inflorescences* borne from the uppermost nodes, paniculiform, the panicles lax and diffuse, the lower branches with male spikelets only, the upper ones with male spikelets below and

terminal female spikelets above or with female spikelets only; pedicels of the female spikelets not thickened, the female spikelets disarticulating below the glumes. *Female spikelets* ellipsoid, shortly pilose on the outer surface of the glumes; glumes subequal, inflated to indurate at maturity; rachilla prominent between the lower and upper glume and thickened, giving the spikelet a pulviniform shape at its base; *lower glume* 5–9-nerved with transverse veinlets, completely embracing the upper glume; *upper glume* 3–6-nerved with transverse veinlets; small stipe present at the base of the anthecium; *anthecium*, indurate, shorter than the glumes, smooth and shining, acute to obtuse apically, with or without conspicuous bicellular, bottle-like microhairs at the tip of the lemma and palea; *lemma* 5-nerved; *palea* 2-nerved; lodicules 3; style 1, stigmas 2. *Caryopsis* ellipsoid, brownish, the hilum linear, 1/2–3/4 the length of the caryopsis. *Male spikelets* lanceolate, acuminate, hispid to glabrous; *lemma* 3–4-nerved; *palea* 2-nerved; anthers 3.

TYPE SPECIES.—*Parodiolyra ramosissima* (Trinius) Soderstrom & Zuloaga.

DISTRIBUTION.—Three species; low- and mid-elevation forests and savannas from Costa Rica south to Bolivia and Bahia, Brazil.

DISCUSSION.—Species of *Olyra* are erect plants that generally occur in shaded forest. They are generally unbranched at the lower nodes and have female spikelets on clavate pedicels in which the glumes are persistent (except for *O. micrantha*). The glumes are not inflated and there is no swollen internode between them. The hilum is linear and extends for the full length of the caryopsis.

Three species previously included in *Olyra* (as *O. lateralis*, *O. luetzelburgii*, and *O. ramosissima*) do not possess the above features but rather share a suite of unusual characters that clearly set them apart. We are establishing *Parodiolyra* to accomodate them. *Parodiolyra* includes decumbent, vine-like, clambering, or declining plants that branch and often root from the lower or from the median and upper nodes. They may grow in shaded forest but also often in full sunlight when enough moisture is available. The female spikelets fall entire, disarticulating below the glumes, and a conspicuous, thickened internode is present between the lower and upper glume in all species. There is also a prolongation of the rachilla between the upper glume and the anthecium, in the form of a slender, thin stipe. Perhaps the most striking feature of this new genus is the presence of a shortened hilum that extends for only 1/2 to 3/4 the length of the caryopsis, never reaching its entire length (as in *Olyra* and most other genera of the tribe Olyreae).

In *Parodiolyra*, the shortened hilum, female spikelet disarticulating entire from a filiform pedicel, and the conspicuous, thickened internode between the glumes are reminiscent of *Raddiella* Swallen and *Diandrolyra* Stapf, rather than *Olyra*. However, plants of *Diandrolyra* differ from *Parodiolyra* in being erect with spike-like inflorescences borne on specialized culms and with the male spikelets bearing only two stamens. *Raddiella*, a genus that inhabits moist areas such as savannas, wet cliff faces, and bases of waterfalls, also has decumbent culms, but it differs from *Parodiolyra* by the disposition of the inflorescences and male and female spikelets within the plants. In *Parodiolyra* the inflorescences are paniculiform, borne only from the uppermost nodes, lax, diffuse, and many-flowered, with the lower branches bearing male spikelets and the upper branches bearing male spikelets below and female spikelets above. In contrast, in *Raddiella* there are numerous axillary inflorescences borne at the median and upper nodes of the plants, and these panicles are small, few-flowered, and usually bear female spikelets only, with the male spikelets confined to terminal panicles.

The species of *Parodiolyra* are also characterized by their inflated, membranous glumes (indurate at maturity in *P. lateralis*), with the lower member amplectent. The female anthecium is smooth and shining, with the tip of the palea with rounded excavations and the upper portion of lemma and palea covered by conspicuous bottle-like, bicellular, secretory microhairs in *P. luetzelburgii* and *P. ramosissima* (completely glabrous in *P. lateralis*). These hairs contain a resin that is secreted when the anthecium is mature and become dark, making the anthecium viscous. In *P. lateralis* the glumes are indurate and purplish and shining at maturity, and Davidse (1987) has suggested that their dark coloration might attract birds, while the induration of the glumes might serve as mechanical protection for the anthecium and its enclosed caryopsis.

Key to the Species of *Parodiolyra*

1. Female spikelets at maturity black, indurate, 2–2.6 mm long, the anthecium glabrous, obtuse apically; leaf blades 2.5–5 cm long . . . . . 1. ***P. lateralis***, new combination (widespread, Costa Rica to Bolivia and Brazil)
1. Female spikelets at maturity light-colored, chartaceous, 3–4.6 mm long, the anthecium with conspicuous bicellular microhairs at the acute apex; leaf blades 4–13 cm long 2

2. Female spikelets 3–3.6 mm long, 1.5-1.7 mm wide; male spikelets 4.1–5 mm long; panicles with the lower branches whorled; ovary glabrous; lower margins of the blades long-ciliate . . . . . 2. ***P. luetzelburgii,*** new combination (northern South America from Venezuela to Maranhão and Mato Grosso, Brazil)

2. Female spikelets 5–5.8 mm long, 1.9–2.8 mm wide; male spikelets 3.5–4.3 mm long; panicles with the lower branches alternate or opposite; ovary pilose towards the summit; lower margins of the blades glabrous or scabrous, not ciliate . . . . . 3. ***P. ramosissima,*** new combination (Bahia, Brazil)

1. *Parodiolyra lateralis* (Presl ex Nees von Esenbeck) Soderstrom & Zuloaga, new combination

FIGURES 39, 40, 44

Panicum lateralis var. α Presl ex Nees von Esenbeck, 1829:213-214. [Type: "In montibus Orinocensibus lectam." Holotype, PR, not seen, fragment of holotype and photograph, US sheet no. 2877929. Nees saw this specimen in the Haenke Herbarium in PR where one of the labels gives as the locality "Peruanae montanae huanoccenses [Department of Huanuco, Peru]," the latter word of which Nees misread as "Orinocences."]

Panicum laterale J.S. Presl, 1830:305. [Type: "Hab. in Peruviae montanis huanoccensibus." By the habitat that Presl cites, he clearly indicates that his *P. laterale* is the Haenke specimen from Peru, var. α of Nees von Esenbeck].

Olyra sarmentosa Doell in Martius, 1877:319. [Type: "A cl. *Poeppig* (n. *3055*) in Brasilia Amazonica, et in republica Peruviana a cl. *Dombey* (n. *146*) lecta." Syntypes, B, not seen, fragments of the syntypes *Poeppig 3055*, US sheet no. 2877929, *Dombey 146*, US sheet no. 2877929.]

Olyra lateralis (Presl ex Nees von Esenbeck) Chase, 1908:179. [Type: Based on *Panicum laterale* var. α Presl ex Nees von Esenbeck, 1829:213–214.]

Raddiella truncata Swallen, 1948:89. [Type: "Guyana, Waratuk Falls, Potaro River Gorge," *Maguire and Fanshawe 23035*. Holotype, US sheet no. 171359; isotypes, NY, US sheet no. 1914990.]

Sprawling perennial. *Culms* up to 8 m or more long, trailing and clambering on vegetation, branching profusely at the median and upper nodes; internodes sulcate, hollow, glabrous, the basal ones elongated, 11–20 cm long and with sheaths only or sheaths with rudimentary blades; nodes thickened, formed by the thickened basal rim of the sheath above and the thickened upper rim of the internode below, pilose with whitish retrorse hairs. *Leaves* with sheaths overlappping, ribbed, sparsely pilose with retrorse hairs, more densely so along the margins, long-ciliate or not at the summit; auricles present, long-ciliate or not; ligule membranous-ciliate, ~0.2 mm long; pseudopetiole, indurate, 1–2 mm long, pale to dark brown, densely pubescent on both surfaces; blades ovate-lanceolate, 2.5–5 cm long, 0.5–1.3 cm wide, rather stiff, asymmetric and truncate basally, the apex asymmetric and apiculate, sparsely ciliate on the margins towards the apex and base, the rest of the surface scabrous or shortly pubescent to glabrous, the abaxial surface glaucous. *Inflorescences* paniculiform, borne profusely from the uppermost nodes, occasionally with panicles produced at the lower nodes, long-exserted, the peduncles 5–9 cm long, glabrous; *panicles* lax, pyramidal, the branches spreading, 1.2–3 cm long, 1.5–3.5 cm wide, the lower branches opposite or alternate and bearing male spikelets only or paired male spikelets (one long and the other short-pedicelled), the upper branches alternate and with female spikelets only, or some specimens with panicles bearing only female spikelets; *axis* and branches cylindrical, flexuous, scabrous to sparsely pilose, the axils of the branches pubescent; pedicels smooth, sparsely pubescent to glabrous. *Female spikelets* elliptical, acute, 2–2.6 mm long, ~1.2 mm wide, greenish to purplish or black at maturity; glumes subequal and longer than the anthecium, indurate at maturity and shining, the lower glume embracing completely the upper one; *lower glume* 5–7-nerved, scabrous to shortly and densely pilose, more densely so towards the base; *upper glume* 3–5-nerved, hispid to glabrous; *anthecium* obovoid, obtuse apically, indurate, whitish, smooth and shining, glabrous, shortly stipitate at the base; *lemma* 7-nerved; *palea* 2-nerved. *Caryopsis* ovoid, brownish, 1 mm long, 0.6 mm wide, the hilum linear, ½ the length of the caryopsis. *Male spikelets* lanceolate, acute, 3–4 mm long, 0.6–0.8 mm wide, shortly pilose to glabrous, brownish to purplish, the glumes occasionally present; *lemma* 3-nerved; *palea* 2-nerved; anthers ~2 mm long, purple.

DISTRIBUTION.—This is the most common and widespread species of *Parodiolyra*. It is distributed from the mountains of Mesoamerica (Costa Rica) into South America, south along the eastern foothills of the Andes to Bolivia and east at the edge of the Guyana highlands to Surinam (Figure 44). The plants inhabit wet savannas, riverbanks, bluffs, and cliffs in full shade or sun, at elevations from 400 to 1800 m above sea level.

ADDITIONAL SPECIMENS SEEN.—BOLIVIA, LA PAZ: Hacienda Simaco, sobre el camino a Tipuani, *Buchtien 5333* (F, MO, NY, US); San Carlos, *Buchtien 25* (US); Ticunhaya, *Tate 1079* (NY, US).

BRAZIL, AMAZONAS: Rio Negro, Serra Curicuriari, *Madison and Kennedy 6565* (US), *Prance et al. 16125* (MO, US). RORAIMA: NE of Mission station, Serra dos Surucucus, *Prance et al. 10011* (MO, US).

COLOMBIA, CHOCÓ: Cerca al Río Atrato, en los alrededores de Quibdó, *Molina and Barkley 19C142* (NY, US). CUNDINAMARCA: "Pipiral," SE of Quetame, *Pennell 1685* (NY, US). MAGDALENA: Santa Marta, *H.H.Smith 2149* (F, MO, US, WIS). META: Las Lagartijas, plateau between Río Papaneme and Río Duda, 11 km SW of Uribe, *Fosberg 19512*

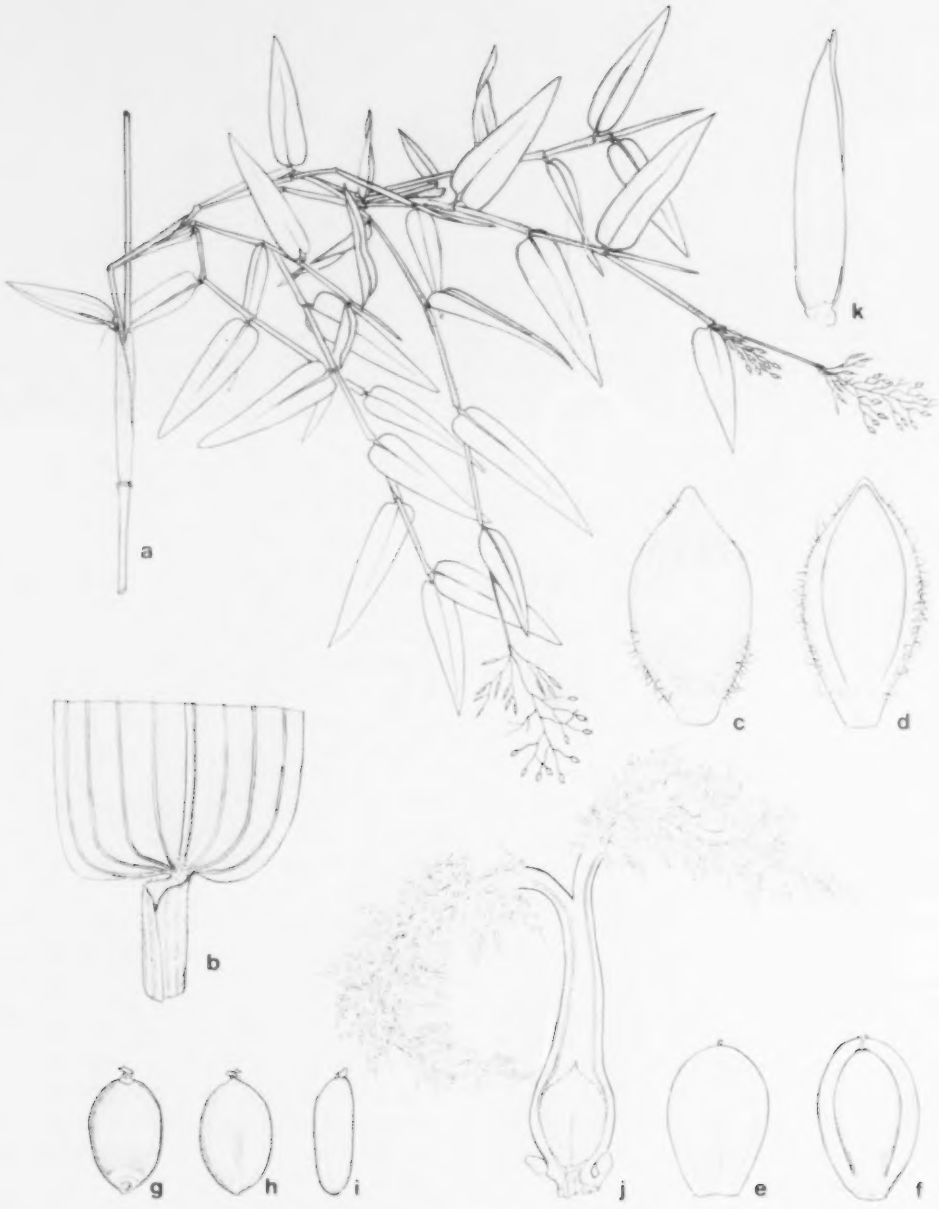


FIGURE 39.—*Parodiolyra lateralis*: *a*, flowering branches with inflorescences (× 0.6); *b*, base of leaf blade (× 3.7); *c*, female spikelet, view of lower glume side (× 15); *d*, female spikelet, view of upper glume side (× 15); *e*, female anthecium, dorsal view (× 15); *f*, female anthecium, ventral view (× 15); *g–i*, caryopsis (× 15); *g*, dorsal view; *h*, ventral view; *i*, side view; *j*, gynecium (× 15); *k*, male spikelet (× 15). Component *a* based on *Skutch 2254* (US); *b* based on *Smith 2149* (US); *c–f,k* based on *MacBride 4990* (US); *g–i* based on *Buchtien 25* (US); *j* based on *Steyermark 89552* (US). All illustrations by G.B. Threlkeld.

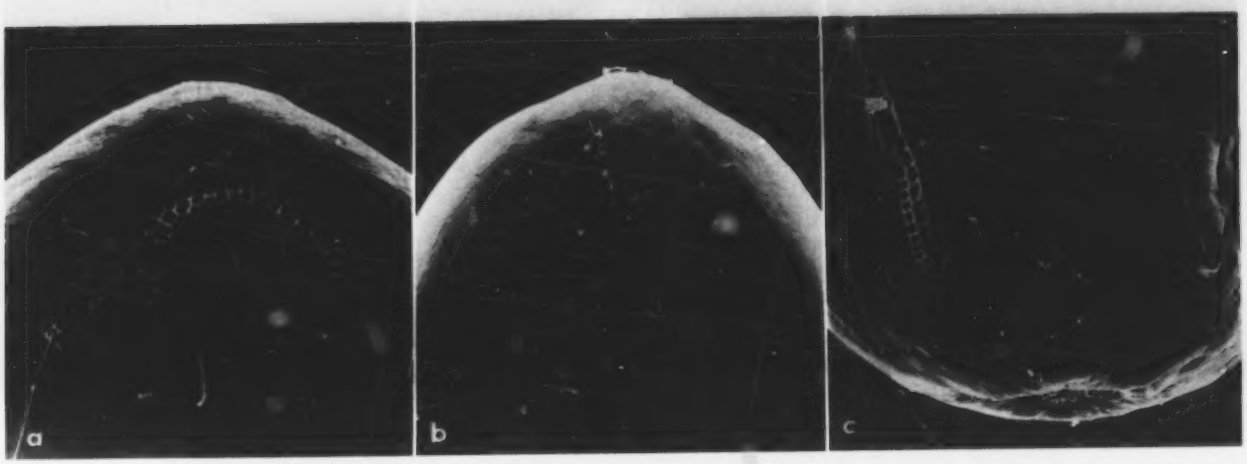


FIGURE 40.—Detail of female anthecium, *Parodiolyra lateralis*: *a*, apex, ventral side (× 200); *b*, apex, dorsal side (× 100); base, *c*, base, ventral side (× 200). All micrographs of *Steyermark et al. 92399* (US). (Reduced to 77% of indicated magnifications for publication.)

(US); Sierra de La Macarena, Central Mountains, Approach Ridge, *Philipson and Idrobo 1877* (US).

COSTA RICA, HEREDIA: Cordoncillal, *Pittier 3641* (US); Cienaga de Agua Buena, Cañas Gordas, *Pittier 11008* (US). SAN JOSÉ: Helechales du General, Vallée du Diquis, *Pittier 12058* (US); vicinity of El General, *Skutch 2254* (MO, US). PROVINCE UNKNOWN: Cienaga de Agua Buena, *Pittier 11008* (US).

GUYANA: Mure-Mure Savanna, Kaieteur Plateau, *Cowan and Soderstrom 2141* (US), *2165* (US).

PANAMA, COCLÉ: El Valle, *Soderstrom 2015* (US). HERRERA: 18 km W of Las Minas, trail to top of Alto Higo, N slope of Cerro Alto Higo, *Hammel 4213* (MO, US). PANAMÁ: Cerro Azul, *Dwyer 1504* (MO, US), *Calderón 2088* (US); Cerro Jefe, *Calderón and Dressler 2139* (US), *Witherspoon 8498* (MO, US); Cerro Campana, *Calderón and Dressler 2129* (US), *Calderón 2092* (US); 7 mi [11 km] N of Cerro Azul on road to Cerro Jefe, *Blum et al. 1789, 1809* (US).

PERU, HUÁNUCO: Andes, *Poeppig 976* (F, US). PASCO: Vilcabamba, hacienda on Río Chinchao, *Macbride 4990* (F, US). SAN MARTÍN: San Roque, *Williams 7111* (F, US). STATE UNKNOWN: Andes, *Poeppig 976* (US).

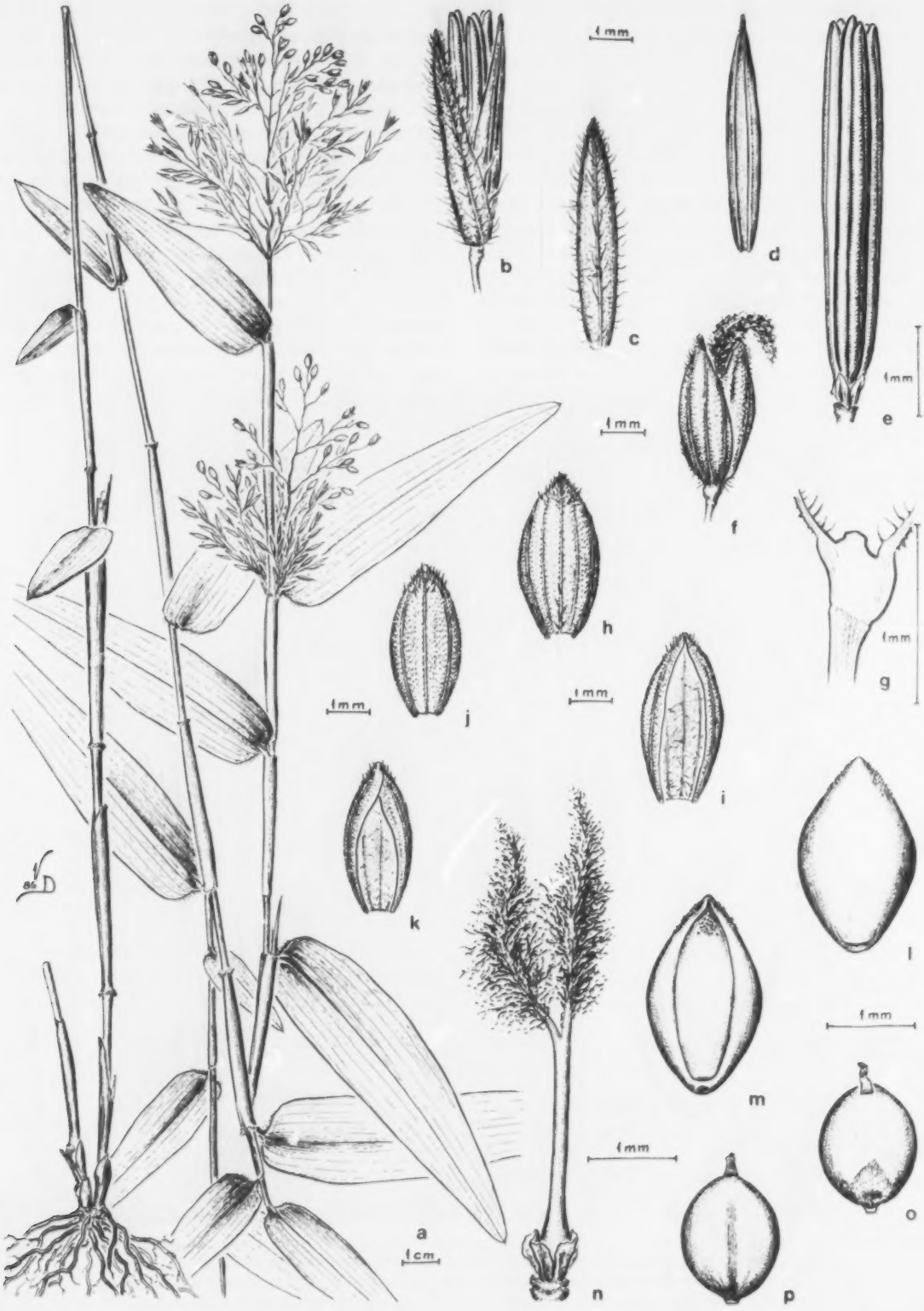
SURINAM: Tafelberg, West Grace Falls, Arrowhead Basin, *Maguire 24501* (F, NY).

VENEZUELA, AMAZONAS: entre Shimada-Wochi y el alto Río Matacuni, Sierra Parima, *Huber and Colchester 8390* (MO, US). BOLÍVAR: 3 km S of El Puajl, *Liesner and Holst 18818* (MO, US); Gran Sabana, between Mision of Santa Teresita de Kavanayen, NW of Río Karuai, *Steyermark 59380* (F, NY, US); between Río Karuai and Salto de Iraba-raima along Río Karuai, at SW base of Ptari-tepuí, *Steyermark 60705* (F, NY, US); Chimantá Massif, along base of southeast-facing sandstone bluffs of Chimantá-tepuí (Toronó-tepuí), *Steyermark 75506* (F, NY, US); Steyermark Falls, on upper reaches of Río Tirica, *Steyermark 76004* (F, NY, US); Sierra de Lema, cabeceras de Río Chinacán 80 km SW of El Dorado, *Steyermark 89552* (F, NY, US); Cerro La Danta, NW of Cerro Venamo, *Steyermark and Nilsson 32* (F, NY); Chimantá Massif, Amuri-tepuí, *Steyermark and Wurdack 1348* (MO, NY, US); Cerro Venamo, subiendo el Río Venamo, *Steyermark et al. 92399* (US); Río Venamo, *Steyermark 92778* (US). DISTRITO FEDERAL: Cerro Naiguatá, arriba del pueblo de Naiguatá, Lomas de Las Delicias, 9–12 km SW de Hacienda Cocuizal, *Steyermark 91998* (US). ZULIA: Perijá, *Gines 1517* (US).

DISCUSSION.—In flower all year. One group of specimens is peculiar in that all panicles of the plant contain only female spikelets. These compare favorably with the type specimen of *Raddiella truncata* Swallen, however close examination of the spikelets reveals that they are like those of *Parodiolyra lateralis* and that the flowering system is that of *Parodiolyra*. In *Raddiella*, the flowering system of the lower nodes produces peduncles, each of which bears only 2–3 female spikelets, while the flowering system of the terminal node produces only panicles bearing male spikelets.

The chromosome number has been recorded as n = 18 (Davidse and Pohl, 1978).

FIGURE 41.—*Parodiolyra luetzelburgii*: *a*, habit; *b*, male spikelet; *c*, male lemma; *d*, male palea; *e*, male flower; *f*, female spikelet; *g*, longitudinal section through pulvinus at base of female spikelet; *h*, lower female glume, dorsal view; *i*, lower female glume, ventral view; *j*, upper female glume, dorsal view; *k*, upper female glume, ventral view; *l*, female anthecium, dorsal view; *m*, female anthecium, ventral view; *n*, female flower; *o*, caryopsis, dorsal view; *p*, caryopsis, ventral view. All based on *Irwin et al. 55516* (US). All illustrations by Vladimiro Dudás.


a
1 cm
b
1 mm
c
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e
1 mm
f
1 mm
g
1 mm
h
i
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k
l
m
n
1 mm
o
1 mm
p

2. *Parodiolyra luetzelburgii* (Pilger) Soderstrom & Zuloaga, new combination

FIGURES 41, 42, 43*a–c*, 44*c*

Olyra luetzelburgii Pilger, 1930:1049. [Type: "Nord-Brasilien: Igarapé, Caicán; auf Sand (Oktober 1927), *von Luetzelburg*, Brasilianische Grenzexpeditionen General Rondon, n. *21354*. " Holotype, B, not seen, fragment of the holotype, US sheet no. 2877941; isotypes, IAN, R.]

Cespitose, short-rhizomatous perennial. *Culms* 70–160 cm tall, erect and geniculate, climbing and leaning on the vegetation, unbranched towards the base, densely branching at the median and upper nodes; internodes cylindrical, hollow, glabrous, the basal internodes with a sheath only or sheaths with a rudimentary or reduced blade; nodes dark, thickened, pubescent with retrorse whitish hairs. *Leaves* with sheaths shorter than the internodes, densely pilose all over the surface to pilose towards the margins and apex, the rest of the surface glabrous, usually mottled with green spots; ligule membranous, short-ciliate at the apex, ~0.4 mm long; pseudopetiole stramineous, densely villous, ~2 mm long; blades ovate-lanceolate, 8–11 cm long, 1.6–3.1 cm wide, stiff, glaucous, flat, basally truncate and slightly asymmetric, the apex asymmetric; both surfaces densely hispid to scabrous or the adaxial surface scabrous and the abaxial one densely pubescent; abaxial surface silvery blue green, the margins long-ciliate towards the base, otherwise scaberulous, cartilaginuous at the tip; midnerve inconspicuous. *Inflorescences* paniculiform, borne from the uppermost nodes, the peduncles ribbed, elongate, glabrous; *panicles* pyramidal, lax, 5–8 cm long, 4.5–8 cm wide, the lower branches whorled, with male spikelets only (these arranged in pairs or in groups of 3 on long pedicels), the upper branches alternate to opposite, with male spikelets below and terminal female spikelets above or only with female spikelets; *axis* scabrous to hispid, longitudi-

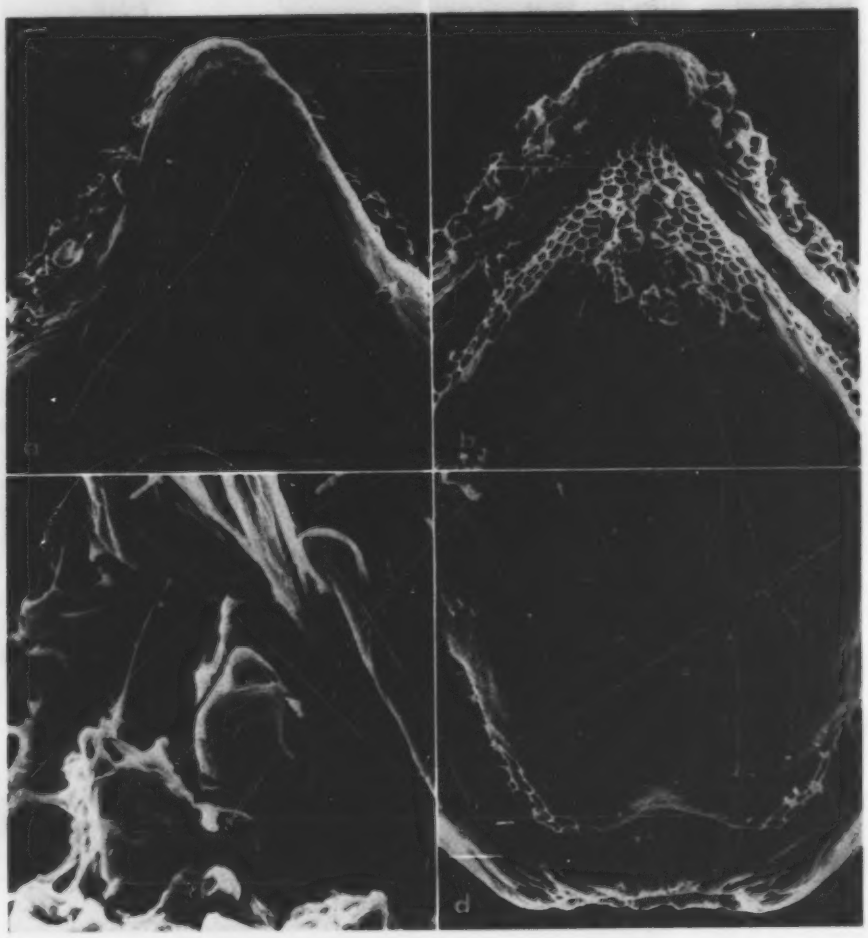


FIGURE 42.—Detail of female anthecium, *Parodiolyra luetzelburgii*: *a*, apex, dorsal side (× 200); *b*, apex, ventral side (× 200); *c*, detail of bicellular microhair on apex of the palea (× 1000); *d*, base, ventral side (× 200). All micrographs of *Black 54-16672* (IAN). (Reduced to 77% of indicated magnifications for publication.)

nally ridged, the branches cylindrical, purplish, the axils of the branches pilose; pedicels smooth, hispid; axillary panicles similar to the terminal one. *Female spikelets* ellipsoid, whitish to purplish, inflated, 3–3.6 mm long, 1.5–1.7 mm wide; glumes subequal, acute, scabrous with short, retrorse hairs, hirsute or not with stiff hairs towards the apex and with short hairs towards the base, separated by a conspicuous, thickened internode, a stipe present at the base of the anthecium; *lower glume* chartaceous, strongly 7–9-nerved, completely embracing the upper glume; *upper glume* chartaceous, strongly 5–7-nerved; *anthecium* lanceolate, shorter than the glumes, 1.9–2.5 mm long, 1–1.2 mm wide, whitish to stramineous, smooth and shining, with numerous bicellular bottle-like microhairs at the acute apex; *lemma* 5-nerved, with rounded excavations towards the apex; *palea* 2-nerved, with rounded excavations towards the apex and on the inner margins; ovary glabrous. *Caryopsis* 1.4 mm long, 0.9 mm wide, the hilum –3/4 as long as the caryopsis. *Male spikelets* lanceolate, 4.2–5.1 mm long, 0.8 mm wide, purplish, acuminate, hispid; *lemma* 3–4-nerved, acute; *palea* 4.1–5 mm long, 2-nerved, sparsely hispid on the middle portion; anthers 3–3.2 mm long.

DISTRIBUTION.—Northern South America from western Venezuela east and south to Maranhão and Mato Grosso, Brazil (Figure 44), growing in open areas, on sandy slopes, ridges, and quebradas, from 100 to 600 m above sea level.

ADDITIONAL SPECIMENS SEEN.—BRAZIL, AMAPÁ: Colônia do Torrão, *Pires and Cavalcante 52636* (MO, US). AMAZONAS: Maués, across from Guaraná factory, *Campbell et al. P21984* (US). MARANHÃO: Itapicurú, *Black et al. 54-16672* (IAN). MATO GROSSO: Município de Colider, 30 km de Guarantan,

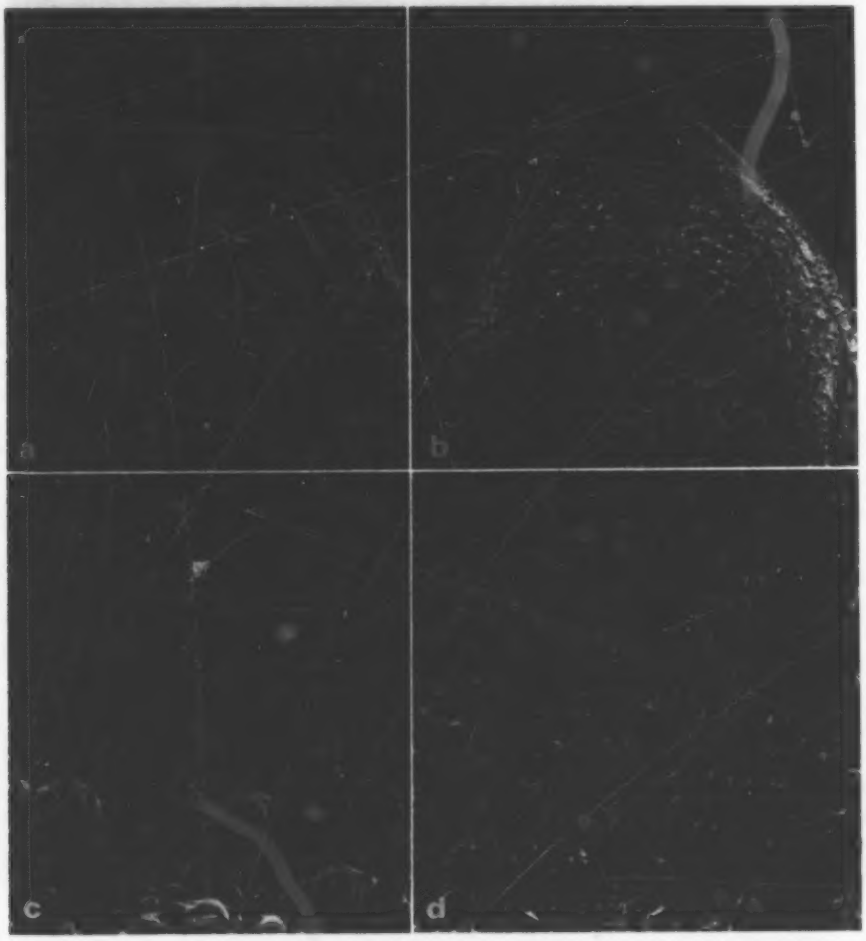


FIGURE 43.—Detail of female spikelets of *Parodiolyra* species. *P. luetzelburgii*: *a*, apex of the spikelet, ventral side, showing cucullate apex (× 70); *b*, apex of the lower glume (× 70); *c*, detail of the surface of the lower glume (× 400). *P. ramosissima*: *d*, detail of the surface of the lower glume showing simple papillae, prickle hairs, and bicellular microhairs (× 400). Micrographs *a–c* of *Wurdack and Adderley 43514* (US); *d* of *Calderón and Pinheiro 2198* (US). (Reduced to 77% of indicated magnifications for publication.)

FIGURE 44.—Distribution map of *Parodiolyra* species.

(IAN); Rio Capim, Aproaga, *Black 48-2385* (IAN, NY, US). RORAIMA: Igarapé Arapapo, *Luetzelburg 21481* (R); Valle do Croe-Cry, *Luetzelburg 21359* (R).

FRENCH GUIANA: Montagnes de la Trinité, *de Granville et al. 6075* (MO).

SURINAM: Wilhelmina Gebergte, 5 km E of confluence of Oost and Lucie riviers, 3°36′–3°41′N, 56°30′–56°34′W, *Irwin et al. 55516* (MO, NY, US); trail line Lucie Rivier-Wilhelmina Mts., slope of unknown peak near km 14, *Schulz 10462* (US).

VENEZUELA, AMAZONAS: ~33 km al NE de Puerto Ayacucho, *Huber 2732* (MO); on right bank of Río Siapa, 8 km below Raudal Gallineta, *Wurdack and Adderley 43514* (MO, NY, US). BOLÍVAR: Morichal El Caballo, ~225 km S of Caicara del Orinoco by road, *Holst and van der Werff 2610* (MO, SI); rapids of Río Apácara, 1/4 mile down stream from the mouth of Río Abácapa to the mouth of Río Abácapa, western side of Apácara-tepuí, *Steyermark 74702* (F, NY, US); Sierra Auraima, en la margen terminal norte sobre el margen oeste del Río Paragua, en la zona del raudal de El Perro, *Steyermark 90817* (F, NY, US). TÁCHIRA: Montaña de Guafitas, just W and N of El Pinal, *Steyermark et al. 119502* (MO, US).

DISCUSSION.—Flowers throughout the year. This species shows a closer resemblance to *P. ramosissima* than to *P. lateralis*.

3. *Parodiolyra ramosissima* (Trinius) Soderstrom & Zuloaga, new combination

FIGURES 43*d*, 44, 45, 46

Olyra ramosissima Trinius, 1834:28 [page 116 in published form, 1835]. [Type: "Bahiens," *Riedel s.n.* Holotype, LE, not seen, fragment of the holotype, US; isotype, GH.]

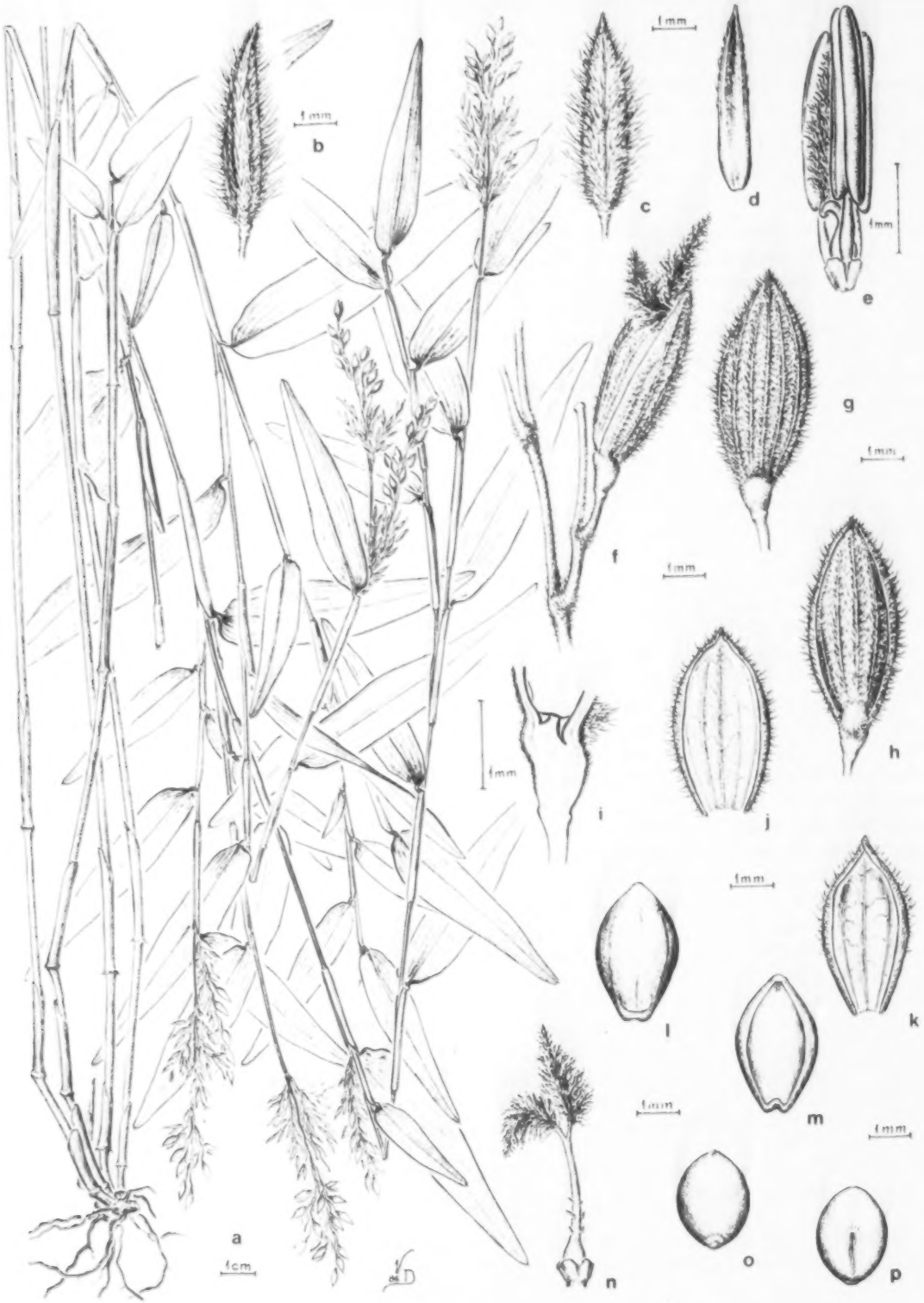
Olyra blanchetii Mez, 1917:46. [Type: "Brasilia, Bahia, loco accuratiore non indicato (*Blanchet* n. *2730*)." Holotype B, not seen, fragment of the holotype, US.]

Cespitose perennial. *Culms* 5–30 per clump, 30–150 cm tall, geniculate at the lower nodes, the young culms erect, unbranched at the lower nodes, profusely branching at the median and upper nodes, climbing and leaning on the vegetation; internodes cylindrical, hollow, maroon to purplish, glabrous, the basal ones with sheaths only or sheaths with rudimentary blades; nodes thickened, densely pilose with long retrorse whitish hairs. *Leaves* with sheaths strongly ribbed, greenish to purplish, glabrous to pubescent with retrorse hairs, the margins ciliate; ligules membranous at the base and short-ciliate at the tip, ~0.3 mm long; pseudopetioles stramineous to purplish, scabrous to densely pubescent with long, whitish hairs, ~2–3 mm long; blades lanceolate, 3.6–13 cm long, 0.9–1.7 cm wide, ascending, stiff, narrowed and asymmetric basally, tapering abruptly to an apiculate tip, glabrous to strongly scabrous, the margins scabrous, the midnerve prominent towards the base, the abaxial surface greenish to somewhat purplish or dark maroon. *Inflorescences* numerous, long-exserted, borne from the uppermost nodes, 3–8 cm long, 1–4 cm wide, the lower branches alternate to opposite and with paired male spikelets (one short and the other long-pedicelled), the upper branches alternate and with male spikelets below and one terminal female spikelet above or with female spikelets only; *axis* longitudinally ridged, scaberulous to short-pubescent, the branches cylindrical, puberulent to scabrous, the axils of the branches pubescent; pedicels of the female spikelets similar to those of the male spikelets, scabrous; axillary panicles similar to the terminal one. *Female spikelets* broadly ellipsoid, inflated, 5–5.8 mm long, 1.9–2.8 mm wide, whitish, obtuse to acute; glumes exceeding the anthecium in length, shortly hispid to scabrous with short, retrorse hairs, glabrous and shining on the inner surface, the internode conspicuous and thickened between the lower glume and the anthecium; *lower glume* 4.1–5.1 mm long, 7–9-nerved with transverse veinlets; *upper glume* 3.9–4.6 mm long, 5–6-nerved with transverse veinlets, acute; *anthecium* ellipsoid, 3–3.3 mm long, 1.5–2 mm wide, acute, whitish to olivaceous at maturity, smooth and shining, with numerous bicellular, bottle-like microhairs at the apex, shortly stipitate at its base, the stipe ~0.3 mm long.; *lemma* 5-nerved, with rounded excavations towards the tip; *palea* 2-nerved, with rounded excavations towards the tip; *ovary* pilose towards summit. *Caryopsis* ellipsoid, brownish, 2–2.5 mm long, 1.4–1.8 mm wide; hilum linear, 1.7–1.9 mm long, 3/4 the length of the caryopsis. *Male spikelets* lanceolate, 3.5–4.3 mm long, 0.7–1 mm wide, purplish, densely hispid with long, whitish hairs; *lemma* 3-nerved, acute; *palea* 2-nerved, pilose in the middle portion to glabrous; pistilode usually present.

DISTRIBUTION.—Endemic to Bahia, Brazil (Figure 44), where it grows on sandy soils within or at the edges of open forests, frequently in disturbed areas, at elevations below 150 m.

ADDITIONAL SPECIMENS SEEN.—BRAZIL, BAHIA: 3 km W of Itacaré, *Soderstrom et al. 2216* (CEPEC, US); rodovía Camamú-Ibirapitanga, 11 km SW of Camamú City, *Calderón and Pinheiro 2237* (CEPEC, US); Reserva Biológica Pau Brasil, 16 km W of Pôrto Seguro, *Calderón and Pinheiro 2198* (CEPEC, US), *Soderstrom et al. 2189* (CEPEC, US), *Eupunino 19* (US), *Hage 67* (CEPEC, US); ramal para Mogiquiçaba, com entrada no km 23 da rodovía Belmonte-Itapebí, *Mattos Silva and Brito 974* (RB, US); ~18 km W of Valença on road to Zona Orobó, *Soderstrom et al. 2162* (CEPEC, US); between Itapebí and Belmonte, 10–12 km E of the Estação Experimental of CEPLAC, *Soderstrom et al 2136* (CEPEC, US); rodovía Camamú a Ibirapitanga, *Pinheiro 1847* (MO, US); km 10, rodovía Pôrto Seguro para Eunápolis, *Calderón 2050* (US); Maraú, *Belém 1810, 1821* (CEPEC, US); entre os kms 45–46 da rodovía Eunápolis-Pôrto Seguro (BR-367), *Mori et al. 10960* (CEPEC, MO, US); 17 km W of Pôrto Seguro, *Mori et al. 10797* (CEPEC); 4 km N of Olivença, on the road from Olivença to Ilhéus, *Mori et al. 13678* (CEPEC, MO); Nova Viçosa, *Guimãraes 1022* (RB); estrada Olivença-Maruim, km 4–5, *Mantone 1006* (RB); antiga rodovía que liga Estação Ecológica de Pau Brasil a Santa Cruz da Cabrália, kms 2 a 9, *Mattos Silva and Brito 898* (RB); rodovía Canavieiras/Camaçã (BA 270), a 20 km W de Canavieiras, *dos Santos and Mattos Silva 3279* (MO); without locality, *Calderón 2448* (US).

DISCUSSION.—In flower between January and October. Until 1966, when Romeu Belém recollected it in Bahia, *P. ramosissima* had been known only from Blanchet and Riedel type collections made there in the 19th century.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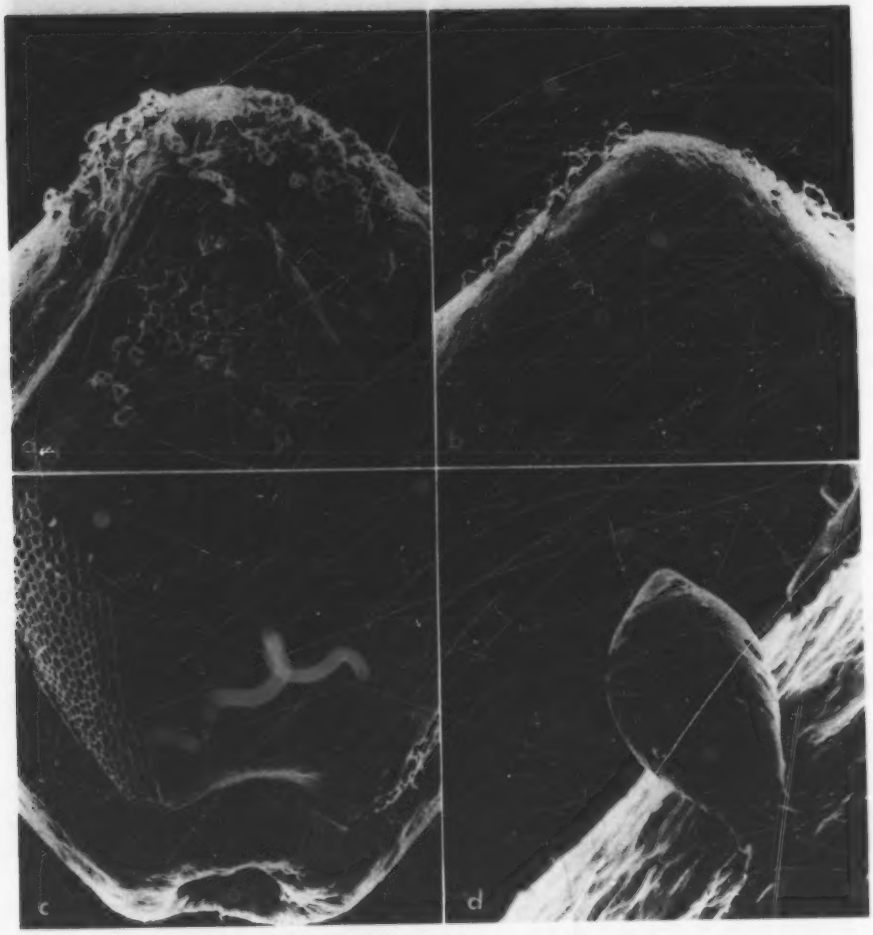

FIGURE 46.—Female anthecium of *Parodiolyra ramosissima*: *a*, apex, ventral side (× 150); *b*, apex, dorsal side (× 100); *c*, base, ventral side (× 100); *d*, detail of microhair on top of the palea (× 1500). Micrograph *a* of *Mori et al. 10960* (US), *b–d* of *Calderón and Pinheiro 2198* (US). (Reduced to 77% of indicated magnifications for publication.)

FIGURE 45.—*Parodiolyra ramosissima*: *a*, habit; *b,c*, male spikelet; *d*, male palea; *e*, male flower; *f*, branchlets bearing female spikelet and male spikelet (fallen); *g*, female spikelet, view of back of lower glume; *h*, female spikelet, view of back of upper glume; *i*, longitudinal section through pulvinus at base of female spikelet; *j*, lower female glume, ventral view; *k*, upper female glume, ventral view; *l*, female anthecium, dorsal view; *m*, female anthecium, ventral view; *n*, female flower; *o*, caryopsis, dorsal view; *p*, caryopsis, ventral view. Component *a* based on *Calderón 2050* (US), *b–p* based on *Calderón 2448* (US), both from Bahia, Brazil. All illustrations by Vladimiro Dudás.

Appendix 1

Names Included in *Olyra* Linnaeus

(Names accepted here are in italics.)

O. amapana Soderstrom & Zuloaga
O. arundinacea Humboldt, Bonpland & Kunth = *O. latifolia*
O. brasiliensis Desvaux = *O. latifolia*
O. brevifolia Schumacher = *O. latifolia*
O. buchtienii Hackel
O. caudata Trinius
O. ciliatifolia Raddi
O. corcovadensis Wawra = *O. glaberrima*
O. cordifolia Humboldt, Bonpland & Kunth = *O. latifolia*
O. cordifolia var. scabriuscula Doell in Martius = *O. latifolia*
O. cuneatifolia Desvaux = *O. ciliatifolia*
O. dimidiata Hochstetter ex Steudel = *O. caudata*
O. d'Urvillei Doell in Martius = *O. micrantha*
O. ecaudata Doell in Martius
O. fasciculata Trinius
O. filiformis Trinius
O. glaberrima Raddi
O. glaberrima var. humilis (Nees von Esenbeck) Mez = *O. humilis*
O. heliconia Lindman = *O. fasciculata*
O. hirsuta Trinius = *O. micrantha*
O. holttumiana Soderstrom & Zuloaga
O. humilis Nees von Esenbeck
O. humilis var. angustifolia Doell in Martius = *O. humilis*
O. humilis var. latifolia Doell in Martius = *O. humilis*
O. juruana Mez
O. kegelii Mez = *O. longifolia*
O. latifolia Linnaeus
O. latifolia var. arundinacea Grisebach = *O. latifolia*
O. latifolia var. glabriuscula Doell in Martius = *O. latifolia*
O. latifolia var. pubescens Doell in Martius = *O. latifolia*
O. latifolia var. vestita Henrard in Amshoff & Henrard = *O. latifolia*
O. latispicula Soderstrom & Zuloaga
O. longifolia Humboldt, Bonpland & Kunth
O. longifolia var. grandifolia Doell in Martius = *O. longifolia*
O. longifolia var. parvifolia Doell in Martius = *O. longifolia*
O. loretensis Mez
O. maranonensis Swallen
O. media Desvaux = *O. latifolia*
O. micrantha Humboldt, Bonpland & Kunth
O. micrantha var. decalvata Doell in Martius = *O. micrantha*
O. micrantha var. lanceolata Doell in Martius = *O. micrantha*
O. micrantha var. subvelutina Doell in Martius = *O. micrantha*
O. obliqua Desvaux = *O. glaberrima*
O. obliquifolia Steudel
O. paniculata Swartz = *O. latifolia*
O. pittieri Hackel = *O. caudata*
O. pubescens Raddi = *O. latifolia*
O. retrorsa Soderstrom & Zuloaga
O. scabra Nees von Esenbeck = *O. latifolia*
O. scorbiculata Schrader ex Nees von Esenbeck = *O. micrantha*
O. semiovata Trinius = *O. glaberrima*
O. semiovata var. pubescens Hackel = *O. glaberrima*
O. semiovata var. pubiflora Hackel = *O. glaberrima*
O. standleyi Hitchcock
O. surinamensis Hochstetter ex Steudel = *O. longifolia*
O. tamanquareana Soderstrom & Zuloaga
O. taquara Swallen
O. urvillei Steudel = *O. micrantha*
O. ventricosa Nees von Esenbeck = *O. micrantha*
O. wurdackii Swallen

Appendix 2

Names Excluded from *Olyra* Linnaeus

(Current names are in italics.)

Olyra axillaris Lamarck = *Lithachne pauciflora* (Swartz) Palisot de Beauvois

Olyra blanchetii Mez = *Parodiolyra ramosissima* (Trinius) Soderstrom & Zuloaga, new combination

Olyra brasiliensis (Bertoloni) Sprengel = *Raddia brasiliensis* Bertoloni

Olyra capillata Trinius = *Cryptochloa capillata* (Trinius) Soderstrom

Olyra capillata var. segregata Doell in Martius = *Cryptochloa capillata* (Trinius) Soderstrom

Olyra concinna Hooker f. = *Cryptochloa concinna* (Hooker f.) Swallen

Olyra flaccida Doell in Martius = *Arberella flaccida* (Doell in Martius) Soderstrom & Calderón

Olyra floribunda Raddi = *Raddia brasiliensis* Bertoloni

Olyra floribunda var. microphylla Doell in Martius = *Raddia brasiliensis* Bertoloni

Olyra hoehnei Pilger = *Raddia brasiliensis* Bertoloni

Olyra lancifolia Mez [This species appears to belong to a different genus from *Olyra*. The poor material available does not allow a decision on its generic disposition to be made at this point.]

Olyra lateralis (Presl ex Nees von Esenbeck) Chase = *Parodiolyra lateralis* (Presl ex Nees von Esenbeck) Soderstrom & Zuloaga, new combination

Olyra luetzelburgii Pilger = *Parodiolyra luetzelburgii* (Pilger) Soderstrom & Zuloaga, new combination

Olyra malaccensis Wallich = *Scleria caricina* (Cyperaceae), teste Chase and Niles (1962)

Olyra malmeana Ekman = *Raddiella malmeana* (Ekman) Swallen

Olyra nana Doell in Martius = *Raddiella esenbeckii* (Steudel) Calderón & Soderstrom

Olyra orientalis Loureiro = not a member of the Poaceae, teste Chase and Niles (1962)

Olyra ovata Hamilton = *Ichnanthus panicoides* Palisot de Beauvois

Olyra pauciflora Swartz = *Lithachne pauciflora* (Swartz) Palisot de Beauvois

Olyra pineti Wright ex Grisebach = *Lithachne pineti* (Wright ex Grisebach) Chase

Olyra podachne Mez = *Cryptochloa capillata* (Trinius) Soderstrom

Olyra polypodioides Trinius = *Raddia distichophylla* (Schrader) Chase

Olyra ramosissima Trinius = *Parodiolyra ramosissima* (Trinius) Soderstrom & Zuloaga

Olyra sampaiana Hitchcock = *Sucrea sampaiana* (Hitchcock) Soderstrom

Olyra sarmentosa Doell in Martius = *Parodiolyra lateralis* (Presl ex Nees von Esenbeck) Soderstrom & Zuloaga

Olyra strephioides Grisebach = *Mniochloa strephioides* (Grisebach) Chase

Olyra strictiflora Fournier = *Cryptochloa strictiflora* (Fournier) Swallen

Olyra sympodica Doell in Martius = *Piresia sympodica* (Doell in Martius) Swallen

Olyra urbaniana Mez = *Raddia guianensis* (Brongniart) Hitchcock

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Review of manuscripts and art by the Press for requirements of series format and style, completeness and clarity of copy, and arrangement of all material, as outlined below, will govern, within the judgment of the Press, acceptance or rejection of manuscripts and art.

Copy must be prepared on typewriter or word processor, double-spaced, on one side of standard white bond paper (not erasable), with 1¼" margins, submitted as ribbon copy (not carbon or xerox), in loose sheets (not stapled or bound), and accompanied by original art. Minimum acceptable length is 30 pages.

Front matter (preceding the text) should include: **title page** with only title and author and no other information, **abstract** page with author, title, series, etc., following the established format; table of **contents** with indents reflecting the hierarchy of heads in the paper; also, **foreword** and/or **preface**, if appropriate.

First page of text should carry the title and author at the top of the page; **second page** should have only the author's name and professional mailing address, to be used as an unnumbered footnote on the first page of printed text.

Center heads of whatever level should be typed with initial caps of major words, with extra space above and below the head, but no other preparation (such as all caps or underline, except for the underline necessary for generic and specific epithets). Run-in paragraph heads should use period/dashes or colons as necessary.

Tabulations within text (lists of data, often in parallel columns) can be typed on the text page where they occur, but they should not contain rules or numbered table captions.

Formal tables (numbered, with captions, boxheads, stubs, rules) should be submitted as carefully typed, double-spaced copy separate from the text; they will be typeset unless otherwise requested. If camera-copy use is anticipated, do not draw rules on manuscript copy.

Taxonomic keys in natural history papers should use the aligned-couplet form for zoology and may use the multi-level indent form for botany. If cross referencing is required between key and text, do not include page references within the key, but number the keyed-out taxa, using the same numbers with their corresponding heads in the text.

Synonymy in zoology must use the short form (taxon, author, year:page), with full reference at the end of the paper under "Literature Cited." For botany, the long form (taxon, author, abbreviated journal or book title, volume, page, year, with no reference in "Literature Cited") is optional.

Text-reference system (author, year:page used within the text, with full citation in "Literature Cited" at the end of the text) must be used in place of bibliographic footnotes in all Contributions Series and is strongly recommended in the Studies Series: "(Jones, 1910:122)" or ". . . Jones (1910:122)." If bibliographic footnotes are required, use the short form (author, brief title, page) with the full citation in the bibliography.

Footnotes, when few in number, whether annotative or bibliographic, should be typed on separate sheets and inserted immediately after the text pages on which the references occur. Extensive notes must be gathered together and placed at the end of the text in a notes section.

Bibliography, depending upon use, is termed "Literature Cited," "References," or "Bibliography." Spell out titles of books, articles, journals, and monographic series. For book and article titles use sentence-style capitalization according to the rules of the language employed (exception: capitalize all major words in English). For journal and series titles, capitalize the initial word and all subsequent words except articles, conjunctions, and prepositions. Transliterate languages that use a non-Roman alphabet according to the Library of Congress system. Underline (for italics) titles of journals and series and titles of books that are not part of a series. Use the parentheses/colon system for volume (number): pagination: "10(2):5–9." For alignment and arrangement of elements, follow the format of recent publications in the series for which the manuscript is intended. Guidelines for preparing bibliography may be secured from Series Section, SI Press.

Legends for illustrations must be submitted at the end of the manuscript, with as many legends typed, double-spaced, to a page as convenient.

Illustrations must be submitted as original art (not copies) accompanying, but separate from, the manuscript. Guidelines for preparing art may be secured from Series Section, SI Press. All types of illustrations (photographs, line drawings, maps, etc.) may be intermixed throughout the printed text. They should be termed **Figures** and should be numbered consecutively as they will appear in the monograph. If several illustrations are treated as components of a single composite figure, they should be designated by lowercase italic letters on the illustration; also, in the legend and in text references the italic letters (underlined in copy) should be used: "Figure 9*b*." Illustrations that are intended to follow the printed text may be termed **Plates**, and any components should be similarly lettered and referenced: "Plate 9*b*." Keys to any symbols within an illustration should appear on the art rather than in the legend.

Some points of style: Do not use periods after such abbreviations as "mm, ft, USNM, NNE." Spell out numbers "one" through "nine" in expository text, but use digits in all other cases if possible. Use of the metric system of measurement is preferable; where use of the English system is unavoidable, supply metric equivalents in parentheses. Use the decimal system for precise measurements and relationships, common fractions for approximations. Use day/month/year sequence for dates: "9 April 1976." For months in tabular listings or data sections, use three-letter abbreviations with no periods: "Jan, Mar, Jun," etc. Omit space between initials of a personal name: "J.B. Jones."

Arrange and paginate sequentially every sheet of manuscript in the following order: (1) title page, (2) abstract, (3) contents, (4) foreword and/or preface, (5) text, (6) appendixes, (7) notes section, (8) glossary, (9) bibliography, (10) legends, (11) tables. Index copy may be submitted at page proof stage, but plans for an index should be indicated when manuscript is submitted.